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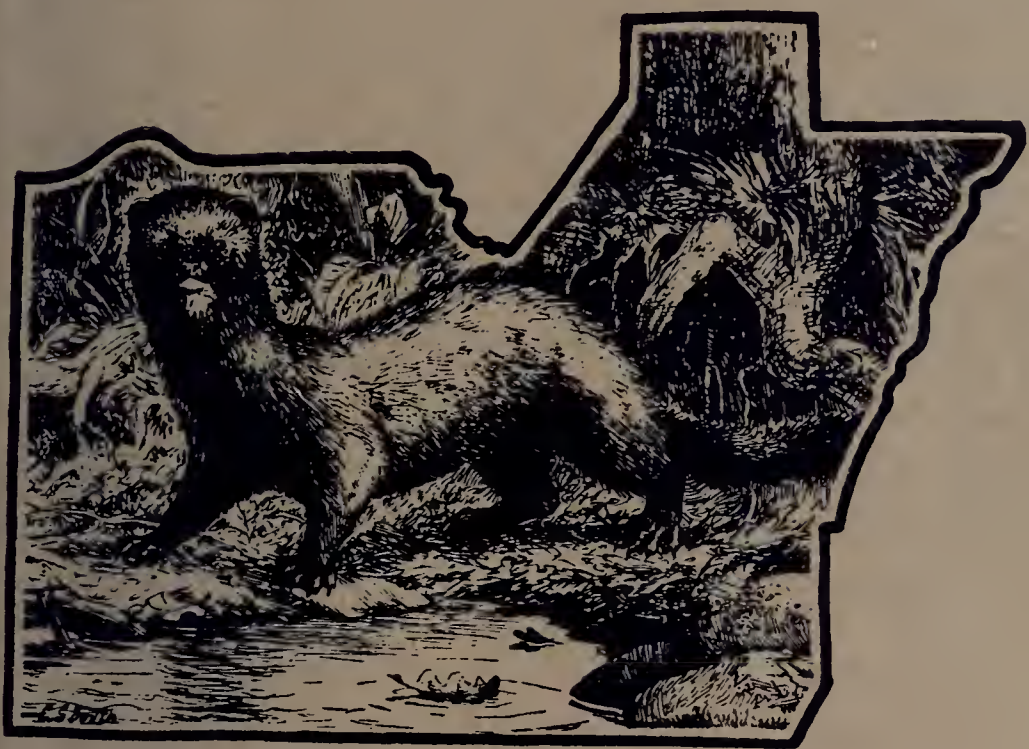
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MAMMAL SURVEY

OF

Southwestern Pennsylvania



FINAL REPORT

PITTMAN-ROBERTSON PROJECT 24-R

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COMMONWEALTH OF PENNSYLVANIA



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MAMMAL SURVEY

OF

SOUTHWESTERN PENNSYLVANIA

By

WILLIAM C. GRIMM

PROJECT LEADER

and

HARVEY A. ROBERTS

ASSISTANT PROJECT LEADER

PUBLISHED BY
PENNSYLVANIA GAME COMMISSION
HARRISBURG, PA.



1950

INTRODUCTION

The survey of the mammals of southwestern Pennsylvania is part of a more comprehensive and state-wide survey to obtain practical management information about the mammals of the Commonwealth with particular reference to their life histories, ecology, range, abundance, habitat preferences, economic importance, and the effects of land use on their populations.

A study of the mammals of northwestern Pennsylvania (Pittman-Robertson Project 20-R) has been completed, and surveys of the mammals of the north central and of the south central portions of the state are currently in progress. Although the present report is based primarily on the specimens and field notes amassed by the personnel of Pittman-Robertson Project 24-R, we have utilized all other available sources of information from the region, including the specimens in the collection of the Carnegie Museum, Pittsburgh, Pennsylvania.

Prior to the present mammal survey the only comprehensive treatise on the mammals of the state was the *Mammals of Pennsylvania and New Jersey*, written by Samuel N. Rhoads and published in 1903. During the half century which has elapsed since Rhoads completed his field work, there have been great changes in the mammalian fauna of the state; and our knowledge of the distribution of many forms has increased with the passing years. There are, however, many gaps in our knowledge regarding even the most common species of mammals. It is hoped that the present survey will fill a very definite need for more comprehensive and up-to-date information on a subject which is not only of great importance to sportsmen, trappers, and farmers, but also of great interest to the growing number of our citizens who find pleasure in the wild creatures of our fields and forests.

ACKNOWLEDGEMENTS

This survey of Pennsylvania mammals in the southwestern section of the state was conducted under the Federal Aid to Wildlife Restoration Act of 1937 as Pennsylvania Pittman-Robertson Project 24-R. It was jointly supervised by the Pennsylvania Game Commission and the United States Fish and Wildlife Service.

The project has been under the active supervision of Mr. Robert D. McDowell, Chief of the Game Commission's Wildlife Research Division.

Dr. J. Kenneth Doult, Curator of the Section of Mammals, Carnegie Museum, Pittsburgh, Pennsylvania assisted in the planning of the field work. He has been responsible for the taxonomic studies which were involved.

Miss Caroline A. Heppenstall, Assistant Curator of Mammals at Carnegie Museum, has been responsible for receiving, cataloging, taking care of the specimens and directing the work of the part-time assistants.

Field work was conducted by the project leader and one assistant leader. The following individuals served as assistant leaders during the survey: Mr. Woodrow W. Goodpaster, from August to October 1947; Mr. Clay L. Gifford, from October 1947 to November 1948; and Mr. Harvey A. Roberts, from November 1948 until the close of the project on June 30, 1949.

The responsibility for the information contained in this report, and the interpretations given it, is that of the writers, William C. Grimm, Project Leader, and Harvey A. Roberts, Assistant Leader.

The following persons served as part-time laboratory assistants at the Carnegie Museum: Messrs. John E. Guilday, A. C. Lloyd, Donald Mears and Joseph C. Weimer. Their work largely involved the preparation of skeletal material. In addition, Mr. Guilday made analyses of the digestive tracts, scats and owl pellets which were collected by the field party, and he definitely added to our knowledge of the bats by making collections in several of the caves throughout the region.

Miss LaVerne Mowry ably served as stenographer throughout the entire survey period; abstracting all of the field notes, typing and filing copies of the field catalogue, and daily notes.

We are deeply indebted to Col. Henry W. Shoemaker of McElhattan, Pennsylvania, for the very complete list of county records of the extinct mammals, a work that involved a great amount of painstaking research.

Supervisor Thomas J. Bell, and the various field officers assigned to Division G, of the Pennsylvania Game Commission have materially assisted us in many ways during the course of the survey.

We are also indebted to many farmers, hunters, trappers and fur dealers for both specimens and valuable information. Especial thanks are due Messrs. Andrew Ewart and Ralph Reynolds of Greene County, and Mr. J. F. Roberts of Confluence, Somerset County, for their cooperation in preserving a large series of the digestive tracts of predatory fur-bearing mammals.

We wish to acknowledge the permission granted us by the Pennsylvania Department of Internal Affairs, Topographic and Geologic Survey to use their map showing the physiographic divisions of Pennsylvania.

We hereby express our appreciation to all of the many agencies and individuals not directly cited above, who have made any contribution to the project in any way.

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GENERAL DESCRIPTION OF THE AREA

The area covered by this survey includes that portion of Pennsylvania south of the Ohio River, from the Ohio state line east to the eastern boundaries of Somerset and Cambria counties. It covers an area of approximately 6,700 square miles, including in entirety the counties of Allegheny, Cambria, Fayette, Greene, Indiana, Somerset, Washington and Westmoreland, and that portion of Beaver County lying south of the Ohio River. There is a difference in elevation of approximately 2,800 feet between the lower Ohio River valley near the Ohio state line and the summit of Mount Davis in the southern part of Somerset County.

Southwestern Pennsylvania is one of the most densely populated sections of the state. There are numerous large urban areas, the largest, of course, being the metropolitan Pittsburgh area in Allegheny County. It is the most highly industrialized section of the entire state. Annually the counties of southwestern Pennsylvania produce more than 80% of all of the bituminous coal mined in the state, and the Pittsburgh region is foremost among the steel-producing centers of the world. Yet, within a fifty-mile radius of metropolitan Pittsburgh, there are numerous farms and thousands of acres of heavily wooded land.

PHYSIOGRAPHY

The rocks of southwestern Pennsylvania are of sedimentary origin. They were laid down in ancient ocean beds or, as in the case of coal, in low-lying swamps which flourished when the land area was slightly elevated above the level of the sea. At the eastern extremity of the study area the strata became much folded due to pressure from the east; but westward the folding was progressively less intense, until, near the western border, these strata appear in a normal or nearly horizontal position. The oldest rock formations are exposed to the eastward where the folding was most intense. They are the hard and highly resistant sandstones and conglomerates which today form the backbone of the mountain ridges. To the westward the outcropping strata become progressively younger until, in Washington and Greene counties, we come to the youngest of all formations, the Permian. (Piper 1933.)

A glance at the map (Fig. 1) shows us that our entire region, except for a small area in the extreme southeastern corner of Somerset County, is included in what is known as the Appalachian Plateau Province. This is in turn divided into two sections; the Pittsburgh Section and the Allegheny Mountains Section.

The terrain of the Pittsburgh Section is severely dissected by a maze of broadly V-shaped valleys. The divides, which are usually broadly A-shaped, all rise to approximately the same elevation. They represent a preexisting plain (peneplain) into which the present day streams have carved their valleys. Elevations today range from 400 to 800 feet above sea level in the stream valleys to 1,200 to 1,600 feet on the hilltops. This

hilltop surface is highest in Greene County and lowest in a belt running northwest and southeast through Pittsburgh. (Ashley 1933.)

East of the Pittsburgh Section we arrive at a mountainous region—the Allegheny Mountains Section—where elevations range from 2,000 to more than 3,000 feet above sea level. It is characterized by a series of mountain ridges which run more or less parallel in a general northeast to southwest direction. The most westerly of these ridges is Chestnut Ridge, entering the region in Fayette County and continuing northeastward through Westmoreland County into Indiana County where it loses its identity as a well-defined ridge. Roughly ten miles farther east we come to the second of these ridges, the Laurel Hill Mountain. It approximately divides Fayette and Westmoreland Counties from Somerset County, then continues northeastward through Cambria County. Between Laurel Hill Mountain and the next ridge, the Allegheny Mountain, there is a rolling plateau where the average elevation exceeds 2,000 feet above sea level. The greater part of Somerset and Cambria counties lie on this plateau. The Allegheny Mountain range forms the eastern boundary of Cambria County and the northeastern boundary of Somerset County. In the south-central part of Somerset County, between Laurel Hill and the Allegheny Mountains, lies the northernmost extremity of the Negro Mountain range, where, on Mount Davis, occurs the highest elevation in the entire state of Pennsylvania—3,213 feet above sea level.

A small portion of Somerset County lying east of the Allegheny Mountain falls within the Ridge and Valley Section of the Appalachian Valley Province. This is a region of many narrow, even-crested ridges running roughly parallel from northeast to southwest. Little Savage and Big Savage Mountains extend north from Maryland into this portion of Somerset County.

DRAINAGE

With the exception of a very small area at the extreme eastern edge of the region, the entire area is drained by tributaries of the Ohio River. Consequently the greater part of this region lies within the Mississippi River Basin. Two large rivers unite at Pittsburgh, in Allegheny County, to form the Ohio River; the Monongahela which flows northward from the highlands of West Virginia, and the Allegheny which flows southward from the elevated Allegheny Plateaus in northwestern Pennsylvania. (Fig. 2.)

The Monongahela River drains all but the extreme western portions of Greene County, the eastern and most of the southern half of Washington County, all of Fayette County, the southern part of Westmoreland County, and that portion of southern Somerset County west of the Allegheny Mountain. The principal tributaries of the Monongahela are the Youghiogheny and Castleman rivers flowing northward out of Maryland; and the Cheat River which flows northward out of West Virginia emptying into the Monongahela just a few miles north of the Pennsylvania-West Virginia state line. Ten Mile Creek drains a large part of Washington and Greene counties, and farther south Dunkard Creek drains a large watershed in the southern part of the latter county.

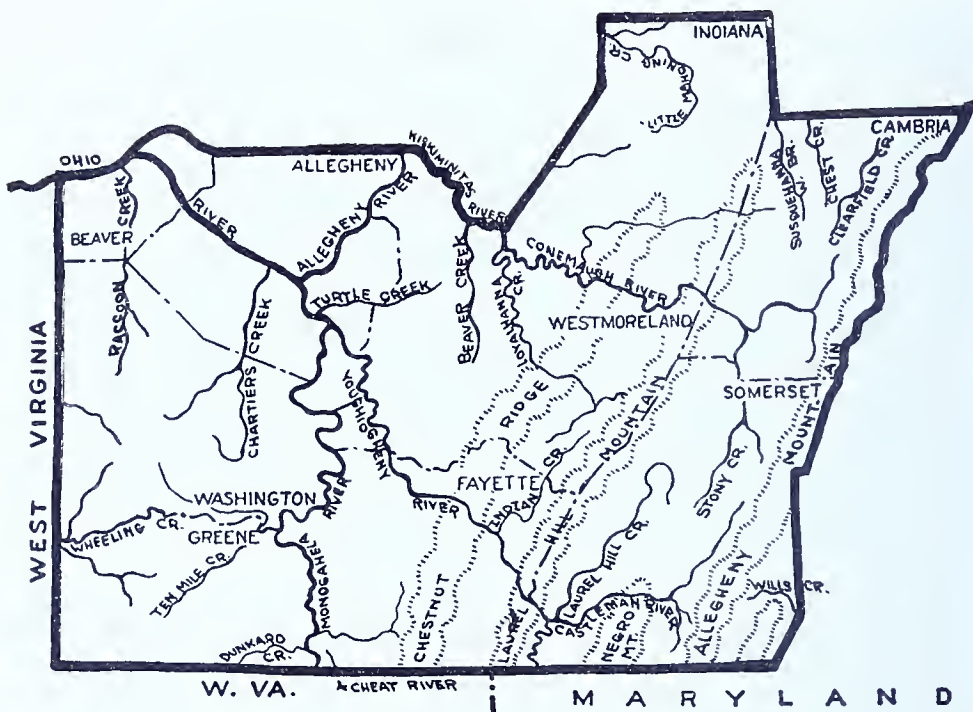


FIG. 2. DRAINAGE PATTERN IN SOUTHWESTERN PENNSYLVANIA

The Allegheny River drains the northern and most of the eastern portions of Westmoreland County, practically all of Indiana County, the southern part of Cambria County, and the northern half of Somerset County. The principal stream tributary to the Allegheny is the Kiskiminitas River with its principal affluents; Loyalhanna Creek, which drains a large portion of Westmoreland County between Chestnut Ridge and Laurel Hill Mountain; and the Conemaugh River draining the southern portions of Indiana and Cambria counties, and the northern portion of Somerset County.

The extreme western portion of Greene County, the northern and western portion of Washington County, the southern part of Beaver County, and the southwestern portion of Allegheny County are drained by creeks and runs emptying into the Ohio River. Some of the principal streams are: Chartiers Creek, which drains portions of Washington and Allegheny counties; Raccoon Creek, draining Washington and Beaver counties; and the many branches or forks of Wheeling Creek, draining the western parts of Washington and Greene counties.

The divide between the Ohio River drainage and streams flowing to the east and south toward the Susquehanna and Potomac River systems runs through Banks, Montgomery and Green townships in Indiana County; thence southeastward through Barr, East Carroll and Allegheny townships in Cambria County to the Allegheny Mountain. The divide then follows this mountain ridge southward through Somerset County to the Maryland state line. The West Branch of the Susquehanna River heads in the northwestern corner of Cambria County. In the central

northern portion of this county Chest Creek drains northward into the West Branch, and farther eastward Clearfield Creek follows a like course. Southward, in Somerset County, is the headwater of the Raystown Branch of the Juniata River, a tributary of the Susquehanna. Waters from the extreme southeast corner of Somerset County, southeast of the Allegheny Mountain, flow by the way of Wills Creek into the Potomac River.

SOIL TYPES

No part of southwestern Pennsylvania has been glaciated; and the soils, except in alluvial bottomlands, have all been derived from the parent rocks. Fig. 3 shows the distribution of the major soil types (U. S. Dept. of Agr. Yearbook 1938) in the present region. A brief discussion of each of these major soil types is presented herewith.

Westmoreland Area: The Westmoreland Area is located near the western edge of the Appalachian Plateau. The rock mass from which these soils developed consists of alternate thin beds of limestone, calcareous and acid gray shales, and sandstones. Depending on the parent material these soils have a brown to grayish-brown, easily penetrated surface. This surface soil covers friable, yellowish-brown sub-soils, or olive-yellow, heavy, blocky clay. The soils rarely cover the bed rock to a depth of more than three feet. Overgrazing and cultivation of the steep slopes have resulted in severe erosion in many places; and nearly all of the land has suffered, in varying degrees, from erosion.

Upshur-Muskingum Area: This area is located in the western part of the Appalachian Plateau; and, in this state, it is confined to Greene County. Alternate thin beds of red calcareous and acid shales, gray shales, and sandstones comprise the parent materials of these soils. A complex of Upshur and Muskingum materials, known as the Meigs soil, is very extensive. They have no definite profile, taking on that of the parent materials. Uphur soils usually have reddish-brown clay loam surface soils and Indian-red clay sub-soils developed upon red calcareous shales. Muskingum soils have grayish-brown silty surface soils over yellow-brown friable sub-soils developed from the gray shales and sandstones. While the soils in the lower elevations are well-drained, erosion is active on the uplands.

Dekalb-Leetonia Areas: Dominant soils of the Dekalb-Leetonia Areas are found on the higher Appalachian Plateau and ridges. One large area is co-extensive with the high plateau region which extends from the eastern part of West Virginia northward through the eastern part of Fayette and Westmoreland counties into the southeastern part of Indiana County. Another extends from the western part of Maryland northward through the plateau region of Somerset and Cambria counties. The shallow, and generally stony, Dekalb soils have for their parent materials weathered sandstones, conglomerate, and shales which are noncalcareous and highly quartzose. These soils occur on sloping and steep lands. They tend to be distinguished by a definite layer of matted brown organic material on the surface; with gray to yellow, mellow, and generally silice-

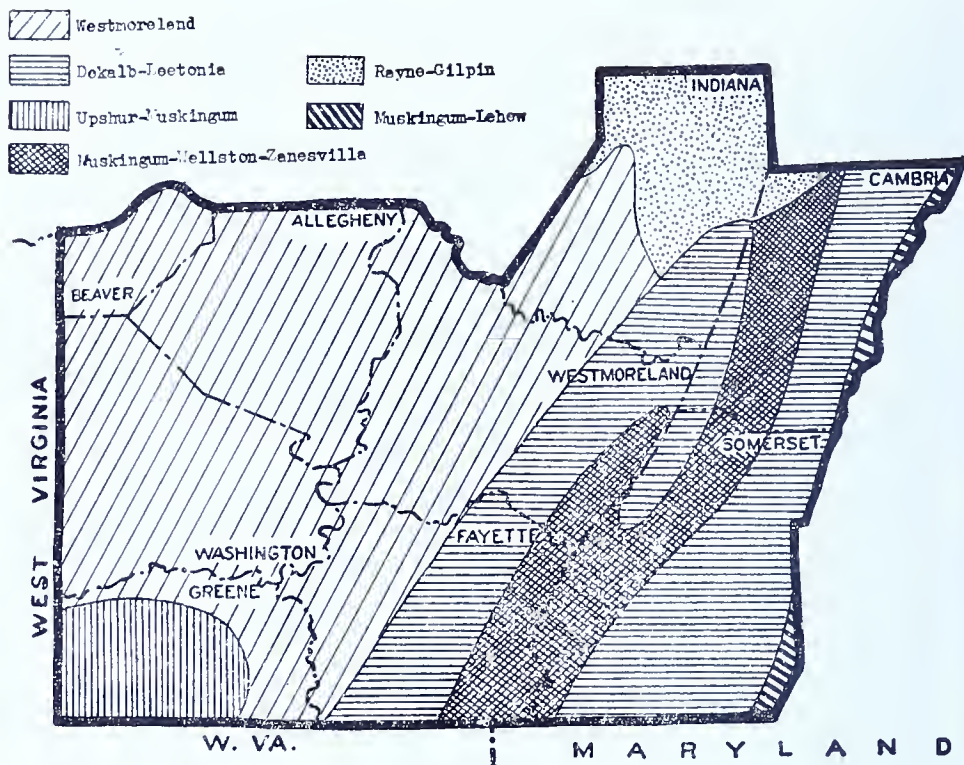


FIG. 3. MAJOR SOIL TYPES

ous surface soil ranging from six to twelve inches in thickness; and a slightly heavier, yellow or yellowish-brown sub-soil which is absent on the steeper slopes. The deeper Leetonia soils, while developed from the same parent materials as the Dekalb soils, occupy the smoother plateau areas and exhibit a characteristic ashy, light-gray leached layer underlain by a coffee-brown, mellow, layer over the disintegrated parent rock. The latter constitute the productive soils of the plateau area.

Muskingum-Wellston-Zanesville Area: The dominant soils of this area are the Muskingum. They are shallow, acid soils developed from a sandstone-shale residuum. Under forest cover they are marked by a very thin covering of loose leaf litter; a dark grayish-brown humus soil, less than two inches thick; a light grayish-yellow, loose, friable, mineral soil, generally acid, and four to eight inches thick; and a layer of mixed fine earth and rock fragments of variable thickness and texture, overlying the bedrock of sandstones and shales. Rock fragments occur on the surface and throughout the soil. These are chiefly timber lands. Some areas are in brushy pasture of poor quality. There is much erosion on cleared lands and many fields are abandoned.

Rayne-Gilpin Area: These soils occupy a portion of the hilly Allegheny Plateau and mountainous regions in the west-central part of Pennsylvania, but in this region they are chiefly confined to the northern

portion of Indiana County. The parent materials consist of gray, yellowish and buff-colored acid sandstones and shales of Pennsylvania age. Virgin Rayne soils have a thin leaf litter underlaid by a thin black leaf mold; one or two inches of grayish-brown silty or loamy soil; about twenty inches of buff or yellowish-brown compact, silty, clay loam; and about thirty inches of disintegrated and weathered sandstones and shales. Throughout the profile, flaggy pieces of sandstone and shale are common. Gilpin soils are similar but less strongly developed. The true soil is seldom more than a foot thick and numerous rock outcrops are not uncommon.

Muskingum-Lehew Area: This area covers that portion of the Appalachian ridges lying just inside the eastern limits of Somerset and Cambria counties. The parent material consists of interbedded red and gray shales. For the most part these soils occur on the steep sloping lands which form the sides of the ridges. The Muskingum soils develop from gray shales. Lehew soils are shallow and similar but were developed from reddish, thin-bedded shales. Except in the case of the immediate surface layer, which is grayish-brown, the soil material exhibits a definite reddish tint. Much of this land is stony and of poor quality. (U. S. Dept. of Agr. Year Book, 1938.)

CLIMATE

The physiography of our region is responsible for conspicuous climatic differences between the low-lying portions of the Allegheny Plateau (Pittsburgh Section) and the mountainous highland regions (Allegheny Mountains Section) in the eastern portion. Average annual temperatures, both in summer and winter, are higher on the western end of the plateau. The average summer temperatures of the Allegheny Mountains Section are generally below 70°F, or from three to six degrees lower than those prevailing in the Pittsburgh Section. Winter temperatures are also correspondingly lower throughout the highland regions. Growing seasons range from 170 days in Allegheny County to only 140 in the elevated plateau region of southern Somerset County. (U. S. Dept. of Agriculture Yearbook, 1941.)

While the mountains of this region are not high or rugged enough to have anything like a true mountain type of climate, they do have many of the characteristics of such a climate in a modified form. The ridges are high enough, however, to have a deflecting influence on the general storm winds. The highlands of Somerset County, for example, have the highest annual precipitation in the present region, averaging fifty inches or more, while a general decrease is evident in all directions. The lowest average annual precipitation, about thirty-six inches, occurs in the southern part of Allegheny County.

During the average winter the summits and upper slopes of the mountain ridges are almost continuously snow-covered from late November until March, while the lowlands to the westward may frequently be bare. The heaviest snowfall occurs on the mountains and on the elevated intermountain plateau, averaging 88 inches a year in Somerset

County. Ice storms are also frequent in these mountain regions during the late fall and winter months. Frequently when a cold rain is falling in the foothills, it freezes and glazes trees above the 2,000 foot level on the mountains. During the winter of 1948-1949 several such ice storms occurred along the top of Laurel Hill Mountain and Chestnut Ridge. The weight of the ice was often so great that the attendant destruction appeared to have been the work of some extremely violent windstorm.

As already mentioned, the growing season in the Allegheny Mountains Section is much shorter than it is to the westward in the less elevated Pittsburgh Section. During the spring seasons it is interesting to watch the progress of the development of vegetation from the foothills to the summits of the mountains. While trees in the foothills and valleys may be very nearly in full leaf, those along the summits of the mountains will barely be starting to grow. In normal years growth at higher elevations on the mountains does not really get well under way before the latter part of May. Due to air drainage, however, frost damage during late spring cold snaps is often more severe in the valleys than it is along mountain ridges. In early June 1949 this was evident in many places. The tender young growth of many woody plants was killed in many low-lying "frost pockets", but relatively little damage was observed on and near the summit of Negro Mountain at an elevation of between 2,800 and 3,200 feet.

NATIVE VEGETATION

Before the advent of European civilization, southwestern Pennsylvania was almost entirely covered with forests of great trees; but we know that there were scattered areas in which trees never did occur, or at least in which they were stunted and isolated. These areas, "where the grasses grew waist high" were natural swampy meadows. Their presence in an otherwise forested domain is to be explained by certain peculiarities of the physiography, to poor drainage and to the accumulation of cold air or "frost pockets" which effectually prohibited or retarded the development of the forest and thereby permitted herbaceous plants locally to assume major roles. The Stony Creek Glades of Somerset County and the great Meadows in the southern part of Fayette County were perhaps the largest and best known of such areas. The former, at least, seems to have been a favorite hunting ground of many early day pioneers; the latter is renowned as the scene of the youthful Washington's ill-fated engagement with French and Indian forces in the year 1754. But there are many other areas—natural glades or sphagnum-cranberry bogs—which never were forested.

There is little left today to indicate what the original forests were like, but from the historical accounts we may gather that they were usually dense and that the individual trees were large. The virgin forests have long since vanished; some were cleared for farms and settlements; greater acreages were wastefully timbered off and subsequently subjected to repeated fires. Practically all of the present day forest has developed within the last half century or less, much of it since we stopped burning it

off every few years. There are now but a few scattered remnants of virgin or old growth timber; and these are mostly represented by isolated tracts of the white oak forest type in the extreme southwestern corner of the region, mostly in Greene County.

Authorities agree that the beech-sugar maple forest represents the final stage of forest succession—the climax—in this region. It is a forest which attains its maximum development only on the deepest, most fertile, and most well-drained soils. If this land area had reached its physiographic maturity, if it had been worn down nearly to base level and active erosion had subsequently ceased, the result would have been the formation of a nearly level plain—geologists call it a peneplain—with a deep, moist, and fertile soil. Had that been the case, the beech-sugar maple forest would have been prevalent over all the region to the exclusion of all other forest types. These are the goals toward which nature is constantly striving, but that goal is still far short of attainment. (Jennings, 1939.)

In the eastern part of the region is a succession of nearly parallel mountain ridges. Their summits and their steep slopes are extremely stony; the soil is thin; it is mostly acid. The rainfall runs off rapidly or drains quickly downward through the porous sandstone rock. In summer it is frequently hot and very dry. Winters are severely cold and the growing season is short. The forest which dominates these ridges must be capable of withstanding these adversities. The forest type occurring on the most exposed and barren, stone-studded summits is an association in which the pitch pine (*Pinus rigida*) is dominant—a forest predominantly comprised of semi-xerophytic, or drought-resisting, plants. In a sense it is the pioneer among forest successions on the mountain ridges. With further improvement in conditions, the accumulation of mineral soil and humus between and over the naked rock, the pitch pine forest is succeeded by other forest types; and today, in our region, this succession has all but eliminated the pitch pine in favor of the red oak-black oak-chestnut oak forest.

West of the mountains is a region of rolling hills, the tops of which are mostly occupied by the white oak forest association. While the soils on these hilltops are rather thin, they are more fertile and growing conditions are much less severe than on the mountain ridges. The association which occupies these hills is composed of plants of more southern affinity, too, than those which flourish on the mountain ridges. The lower slopes of the hills have somewhat deeper soils and more fertile ones than the hilltops. It is on these lower slopes that the red oak-basswood-white ash forest so commonly occurs. And finally, on the deepest, and richest, and well-drained soils, built up above the flood-plains of the stream valleys, the climax forest of beech and sugar maple assumes some degree of prominence.

On the rolling plateau of Cambria County and the northwestern portion of Indiana County, the prevailing forest was formerly, at least, one of the hemlock forest association. It is an admixture of the more northerly conifer forest and hardwoods, and prior to the interference by man the conifers were dominant over much of this area. Their re-

moval has resulted in their succession by a dominantly hardwood forest, primarily of the beech-sugar maple type. Elsewhere in our region the hemlock forest is not extensive although it occurs locally in ravines, on cool northern exposures, and about or in some of the swamps of the mountain tops.

The accompanying map (Fig. 4) indicates the general distribution of the major forest types in the region. It is not possible to indicate local or minor variations, or to include several of the minor associations occurring in the region. Two of the latter, the sycamore-American elm-silver maple association and the hemlock-birch-rhododendron association, which occur in the regional stream valleys are described in greater detail on subsequent pages.

THE RED OAK-BLACK OAK-CHESTNUT OAK FOREST ASSOCIATION

This is the most common and characteristic forest association of our mountain ridges, where it extends down the drier and warmer slopes practically to the foothills. Jennings (1939) divided the mountain forests into four separate forest associations: pitch pine forest, chestnut oak forest, chestnut forest and the black oak-scarlet oak forest. The pitch pine forest association is not important in our region, but it is prevalent on many of the mountain ridges to the eastward. It occurs on the driest and most barren situations; and the principal species comprising it are semi-xerophytic, or drought resisting. In the region the soil and moisture conditions, while varying locally, are such that the dominant forest is primarily of oaks. While rainfall is not deficient, the nature of the terrain, the structure of the rocks, and the amount of soil and humus which retain moisture vary considerably from site to site. Certain sites become dry during the summer simply because the rainfall drains rapidly away through the sand and the coarse and porous sandstone rocks. In other places water accumulates to such an extent in shallow basins that true bogs actually exist. There are also all degrees of intergradation between these two extremes.

The soil everywhere is more or less rocky; and in general it is shallow, sandy and acid. The chestnut oak and the black oak occur more commonly on the drier sites while red oak occurs more abundantly wherever better soil moisture conditions prevail. There are often exceedingly rocky but moist situations, where there is very little soil or humus except that which has accumulated between the blocks of rock. On such sites the dominant species are most frequently yellow birch and rhododendron, and sometimes American mountain ash. Local swampy or bog areas were formerly, at least, dominated by trees common to the hemlock forest association. It appears that the principal pioneer species in severely burned-over areas were large-toothed aspen, red maple and sassafras.

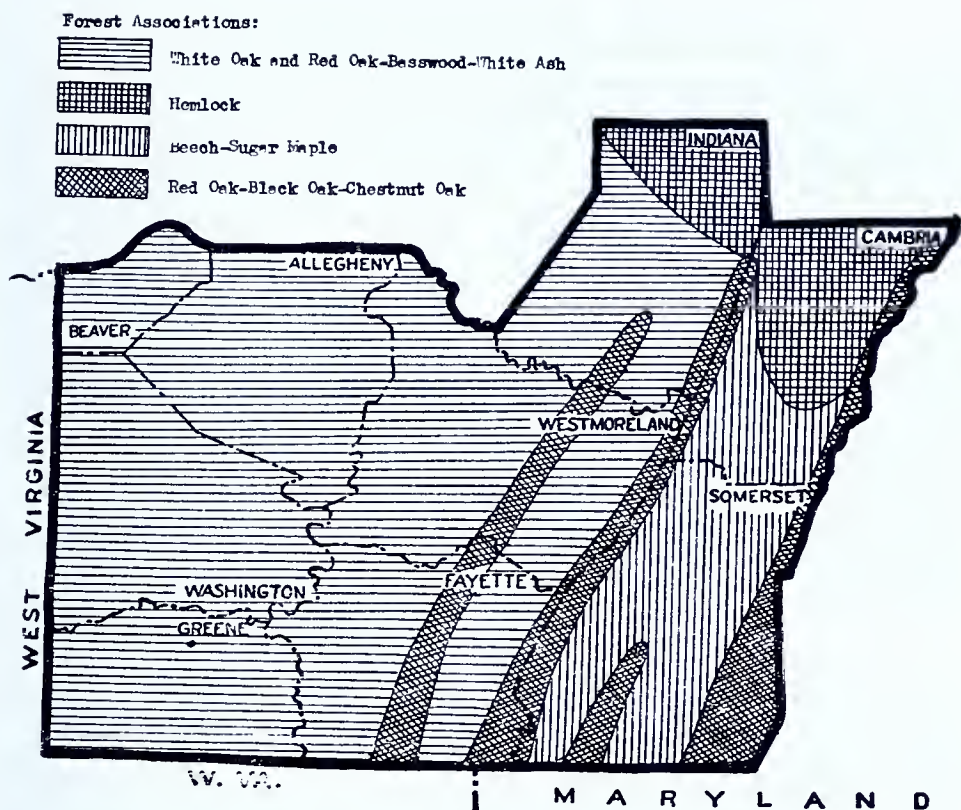


FIG. 4. DISTRIBUTION OF THE MAJOR FOREST TYPES

RED OAK-BLACK OAK-CHESTNUT OAK FOREST ASSOCIATION

TREES

Dominant:

- Red Oak (*Quercus borealis* var. *maxima*)—moist sites
- Black Oak (*Quercus velutina*)—moist to dry sites
- Scarlet Oak (*Quercus coccinea*)—moist to dry sites
- Chestnut Oak (*Quercus montana*)—dry sites

Primary Associates:

- Red Maple (*Acer rubrum*)
- Black Gum (*Nyssa sylvatica*)
- Pitch Pine (*Pinus rigida*)
- Sassafras (*Sassafras albidum*)
- Chestnut (*Castanea dentata*)—formerly important

Secondary Associates:

- White Oak (*Quercus alba*)
- Tulip Tree (*Liriodendron tulipifera*)
- Cucumber Tree (*Magnolia acuminata*)
- Black Birch (*Betula lenta*)
- Yellow Birch (*Betula lutea*)
- Wild Black Cherry (*Prunus serotina*)
- Fire Cherry (*Prunus pennsylvanica*)
- Large-toothed Aspen (*Populus grandidentata*)
- Quaking Aspen (*Populus tremuloides*)
- Black Locust (*Robinia pseudo-acacia*)

UNDERSTORY TREES, SHRUBS, AND WOODY VINES

Common Greenbrier (*Smilax rotundifolia*)
Early Low Blueberry (*Vaccinium angustifolium*)
Late Low Blueberry (*Vaccinium pallidum*)
Deerberry (*Vaccinium stamineum*)
Black Huckleberry (*Gaylussacia baccata*)
Mountain Laurel (*Kalmia latifolia*)
Pink Azalea (*Rhododendron nudiflorum*)
Scrub Oak (*Quercus ilicifolia*)
Hercules' Club (*Aralia spinosa*)
Dwarf Sumach (*Rhus copallina*)
Poison Ivy (*Rhus radicans*)
Round-leaved Gooseberry (*Ribes rotundifolium*)
Witch-hazel (*Hamamelis virginiana*)
Large-leaved Holly (*Ilex montana*)
Maple-leaved Viburnum (*Viburnum acerifolium*)
High-bush Blackberry (*Rubus allegheniensis*)
Striped Maple (*Acer pennsylvanicum*)
Flowering Dogwood (*Cornus florida*)
Bush Honeysuckle (*Diervilla lonicera*)
Mountain Ash (*Sorbus americana*)

HERBS

Large-flowered White Trillium (*Trillium grandiflorum*)
Painted Trillium (*Trillium undulatum*)
Wild Sarsaparilla (*Aralia nudicaulis*)
Trailing Arbutus (*Epigaea repens*)
Teaberry (*Gaultheria procumbens*)
Stemless Lady's Slipper (*Cypripedium acaule*)
Yellow Clintonia (*Clintonia borealis*)
White Clintonia (*Clintonia umbellulata*)
Fringed Polygala (*Polygala paucifolia*)
Round-leaved Violet (*Viola rotundifolia*)
Indian Cucumber-root (*Medeola virginica*)
Wild Yam-root (*Dioscorea villosa*)
Dwarf Ginseng (*Panax trifolia*)
Sweet White Violet (*Viola blanda*)
Dog Violet (*Viola conspersa*)
Hastate-leaved Violet (*Viola hastata*)
False Lily-of-the-valley (*Maianthemum canadense*)
Wild Indigo (*Baptisia tinctoria*)
Hairy Angelica (*Angelica villosa*)
Mountain Aster (*Aster acuminatus*)
Hawkweed (*Hieracium paniculatum*)
Indian Physic (*Gillenla trifoliata*)
Great Willow-herb (*Epilobium angustifolium*)
Four-leaved Loosestrife (*Lysimachia quadrifolia*)
Tick Trefoil (*Desmodium nudiflorum*)

FERNS AND CLUBMOSES

Bracken (*Pteridium latiusculum*)
Hay-scented Fern (*Dennstaedtia punctilobula*)
New York Fern (*Dryopteris noveboracensis*)
Spinulose Shield Fern (*Dryopteris intermedia*)
Interrupted Fern (*Osmunda claytoniana*)
Cinnamon Fern (*Osmunda cinnamomea*)
Christmas Fern (*Polystichum acrostichoides*)
Rattle-snake Fern (*Botrychium virginianum*)
Trailing Ground Pine (*Lycopodium complanatum*)
Tree Club Moss (*Lycopodium obscurum*)

THE WHITE OAK FOREST ASSOCIATION

The white oak forest association and the red oak-basswood-white ash forest association occur rather generally throughout that portion of southwestern Pennsylvania to the westward of the Laurel Hill Mountain, including most of the valley area between Laurel Hill and Chestnut Ridge.

The white oak forest here characteristically occupies the uplands and particularly the rounded hilltops, although locally typical examples may even occur in the broader valleys. Usually the soil is thin and often stony, and on the wind-swept hilltops there is a very meager accumulation of leaf litter and humus. On exceptionally dry or rocky knobs, outposts of the ridge type oak forest sometimes occur, being represented by such species as the chestnut oak (*Quercus montana*), mountain laurel (*Kalmia latifolia*) and various species of blueberries (*Vaccinium*).

The greater part of the land area formerly occupied by the white oak forest has long since been cleared. Today only isolated tracts of large sized trees remain, and they are rapidly being cut to meet the demands for lumber and barrel staves. Much of the land area which was cleared for agriculture provided good to excellent pasture as it was capable of producing a luxurious bluegrass sod, but in most cases it proved to be too steep for cultivation and erosion quickly stripped off the thin layer of top soil. Abandoned farm fields typically revert to an early seral stage in which the wild oat grass (*Danthonia spicata*) and broomsedge (*Andropogon virginicus*) are conspicuous dominants. They are in turn followed by common cinquefoil (*Potentilla canadensis*), field goldenrod (*Solidago juncea*), dewberry (*Rubus villosus*), and eventually by high-bush blackberry (*Rubus allegheniensis*), sumachs (*Rhus glabra* and *Rhus typhina*), wild crabapples (*Malus coronaria* and *Malus lancifolia*), and hawthorns (*Crataegus* sp.).

WHITE OAK FOREST ASSOCIATION

TREES

Dominant:

White Oak (*Quercus alba*)

Primary Associates:

Red Oak (*Quercus borealis* var. *maxima*)
Black Oak (*Quercus velutina*)
Scarlet Oak (*Quercus coccinea*)
Shag-bark Hickory (*Carya ovata*)
Wild Black Cherry (*Prunus serotina*)

Secondary Associates:

Mockernut Hickory (*Carya tomentosa*)
Pignut Hickory (*Carya glabra*)
Black Walnut (*Juglans nigra*)
White Ash (*Fraxinus americana*)
Tulip Tree (*Liriodendron tulipifera*)
Sour Gum (*Nyssa sylvatica*)
American Hop Hornbeam (*Ostrya virginiana*)
Chestnut (*Castanea dentata*)
Juneberry (*Amelanchier canadensis*)

Dominant:

Flowering Dogwood (*Cornus florida*)
 Hazelnut (*Corylus americana*)
 Virginia Creeper (*Parthenocissus quinquefolia*)
 Poison Ivy (*Rhus radicans*)
 Blue-leaved Grape (*Vitis argentifolia*)
 Witch-hazel (*Hamamelis virginiana*)
 Maple-leaved Viburnum (*Viburnum acerifolium*)
 Black Haw (*Viburnum prunifolium*)
 American Crabapple (*Malus coronaria*)
 Prickly Gooseberry (*Ribes cynosbati*)
 Burning Bush (*Euonymus atropurpureus*)
 High-bush Blackberry (*Rubus allegheniensis*)
 American Bladder-nut (*Staphylea trifolia*)
 Redbud (*Cercis canadensis*)
 Mountain Laurel (*Kalmia latifolia*)

HERBS

Mayapple (*Podophyllum peltatum*)
 Early saxifrage (*Saxifraga virginiana*)
 Carolina Spring Beauty (*Claytonia caroliniana*)
 Virginia Spring Beauty (*Claytonia virginica*)
 Early Rock Cress (*Arabis laevigata*)
 Toothwort (*Dentaria laciniata*)
 Wild Geranium (*Geranium maculatum*)
 Bluets (*Houstonia caerulea*)
 Rue Anemone (*Anemonella thalictroides*)
 Bloodroot (*Sanguinaria canadensis*)
 Hepatica (*Hepatica triloba* and *H. acutiloba*)
 Rattle-snake Weed (*Hieracium venosum*)
 Tick Trefoil (*Desmodium nudiflorum*)
 Shin-leaf (*Pyrola elliptica*)
 Sanicle (*Sanicula canadensis* and *S. trifoliata*)
 Goldenrods (*Solidago bicolor*, *S. nemoralis*, *S. rugosa*)
 Asters (*Aster undulatus*, *A. cordifolius*, *A. macrophyllus*)

THE RED OAK-BASSWOOD-WHITE ASH FOREST ASSOCIATION

On the lower slopes of the hills, where the soils are deeper and more fertile than those of the white oak hilltops, the prevailing forest is the red oak-basswood-white ash forest association. "The soil on these slopes is much mixed and patchy, due to landslides of various degrees and to the upturning of soil on the roots of fallen trees, these circumstances leading to a mixing of humus material, clay, and stones into a variety of small areas of differing characteristics, but in general fairly loose and moist" (Jennings 1939).

This is a variable type of forest. It is a mixture of many kinds of trees, and there are many local differences in the dominance of the various species. It more or less combines the constituents of both the white oak and the beech-sugar maple forests, apparently being the intermediate succession between the two. It has the richest spring flora of any forest type—the trillium aspect being particularly noteworthy; but the canopy is not usually so dense as to preclude a variety of understory shrubs and summer-flowering herbaceous plants.

RED OAK—BASSWOOD—WHITE ASH ASSOCIATION

TREES

Dominant:

- Red Oak (*Quercus borealis* var. *maxima*)
- Basswood (*Tilia americana*)
- White Ash (*Fraxinus americana*)

Primary Associates:

- White Oak (*Quercus alba*)
- Black Oak (*Quercus velutina*)
- Red Maple (*Acer rubrum*)
- Sugar Maple (*Acer saccharum*)
- Black Maple (*Acer nigrum*)
- Beech (*Fagus grandifolia*)
- Wild Black Cherry (*Prunus serotina*)

Secondary Associates:

- Tulip Tree (*Liriodendron tulipifera*)
- Butternut (*Juglans cinerea*)
- Black Walnut (*Juglans nigra*)
- Shag-bark Hickory (*Carya ovata*)
- Mockernut Hickory (*Carya tomentosa*)
- Bitternut Hickory (*Carya cordiformis*)
- American Hop Hornbeam (*Ostrya virginiana*)
- American Elm (*Ulmus americana*)
- Slippery Elm (*Ulmus fulva*)
- Hemlock (*Tsuga canadensis*)
- White Pine (*Pinus strobus*)

UNDERSTORY TREES, SHRUBS, AND WOODY VINES

- Witch-hazel (*Hamamelis virginiana*)
- Flowering Dogwood (*Cornus florida*)
- Alternate-leaved Dogwood (*Cornus florida*)
- Blue Beech (*Carpinus caroliniana*)
- Juneberry (*Amelanchier canadensis*)
- Arrow-wood (*Viburnum dentatum*)
- Maple-leaved Viburnum (*Viburnum acerifolium*)
- Spicebush (*Lindera benzoin*)
- Wild Hydrangea (*Hydrangea arborescens*)
- High-bush Blackberry (*Rubus allegheniensis*)
- Black Raspberry (*Rubus occidentalis*)
- Purple-flowering Raspberry (*Rubus odoratus*)
- American Bladdernut (*Staphylea trifolia*)
- Burning Bush (*Euonymus atropurpureus*)
- Blue-leaved Grape (*Vitis argentifolia*)
- Common Greenbrier (*Smilax rotundifolia*)
- Common Elder (*Sambucus canadensis*)

HERBS

- Hepatica (*Hepatica triloba* and *H. acutiloba*)
- Virginia Spring Beauty (*Claytonia virginica*)
- Bloodroot (*Sanguinaria canadensis*)
- Early Saxifrage (*Saxifraga virginiana*)
- Early Carex (*Carex pennsylvanica*)
- Toothwort (*Dentaria laciniata*)
- Early Meadow Rue (*Thalictrum dioicum*)
- Blue Cohosh (*Caulophyllum thalictroides*)
- Dutchman's Breeches (*Dicentra cucullaria*)
- Wild Leek (*Allium tricoccum*)
- Stonecrop (*Sedum ternatum*)

Large-flowered White Trillium (*Trillium grandiflorum*)
 Purple Trillium (*Trillium erectum*)
 Snow Trillium (*Trillium nivale*)
 Dwarf Larkspur (*Delphinium tricorne*)
 Wild Ginger (*Asarum canadense*)
 Wild Geranium (*Geranium maculatum*)
 Early Blue Phlox (*Phlox divaricata*)
 Chickweed (*Stellaria pubens*)
 Sweet Cicely (*Osmorrhiza longistylis* and *O. claytoni*)
 False Solomon's Seal (*Smilacina racemosa*)
 Virginia Waterleaf (*Hydrophyllum virginicum*)
 Honewort (*Cryptotaenia canadensis*)
 Black Snakeroot (*Cimicifuga racemosa*)
 White Snakeroot (*Eupatorium urticaefolium*)
 Wood Nettle (*Laportea canadensis*)
 Wreath Goldenrod (*Solidago caesia*)
 Broad-leaved Goldenrod (*Solidago latifolia*)
 Crooked-stemmed Aster (*Aster divaricatus*)

FERNS

Christmas Fern (*Polystichum acrostichoides*)
 Spinulose Shield Fern (*Dryopteris intermedia*)
 Marginal Shild Fern (*Dryopteris marginalis*)
 Rattlesnake Fern (*Botrychium virginianum*)

THE BEECH-SUGAR MAPLE FOREST ASSOCIATION

The beech-sugar maple forest occupies the fertile and well-drained soils which have resulted from the deep disintegration of the rocks and the accumulation of a considerable amount of humus. Jennings (1939) says, "This type of soil might be considered to be about the last step in the wearing down of rocky mountain ridges to the final stage of more or less level lowlands; and, correspondingly, the vegetation represents the last or climax stage of the forest succession". The same authority (1943) states that "Climax soils of this type may develop in various ways. In our region, as in Somerset County, they may develop in sheltered coves, or on level terraces, or, they may be developed as fertile, moist, but well-drained floodplains along streams".

The early spring flora of the beech-maple woods is rich and varied, but the floral procession practically terminates as soon as the leaves of the trees develop. Both the sugar maple and the beech are sufficiently tolerant of shade so that they can reproduce in their own understory, but this prevents other species from affording much competition. By midsummer, ferns constitute most of the groundcover aside from the seedlings of the beech and sugar maple trees.

This type of forest is most prevalent on the rolling plateau between Laurel Hill and the Allegheny Mountains, but it also occurs less frequently in fertile bottomlands in other parts of the region. In the mountains it often occurs on the moister northern exposures while the forest on the opposite, or drier and hotter, southern exposure will be predominantly one of oaks. Owing to the fact that these soils are good agricultural soils, much of the land area was soon cleared. Many of the best farms are to be found on land formerly occupied by the beech-maple forest.

BEECH—MAPLE FOREST ASSOCIATION

TREES

Dominant:

Sugar Maple (*Acer saccharum*)

Beech (*Fagus grandifolia*)

Primary Associates:

Red Maple (*Acer rubrum*)

Wild Black Cherry (*Prunus serotina*)

Tulip Tree (*Liriodendron tulipifera*)

Red Oak (*Quercus borealis* var. *maxima*)

Secondary Associates:

White Oak (*Quercus alba*)

Basswood (*Tilia americana*)

Cucumber Tree (*Magnolia acuminata*)

White Ash (*Fraxinus americana*)

Black Birch (*Betula lenta*)

Yellow Birch (*Betula lutea*)

Shag-bark Hickory (*Carya ovata*)

Butternut (*Juglans cinerea*)

Hemlock (*Tsuga canadensis*)

White Pine (*Pinus strobus*)

UNDERSTORY TREES, SHRUBS, AND WOODY VINES

Maple-leaved Viburnum (*Virburnum acerifolium*)

Common Elder (*Sambucus canadensis*)

High-bush Blackberry (*Rubus allegheniensis*)

Black Raspberry (*Rubus occidentalis*)

Witch-hazel (*Hamamelis virginiana*)

Spice Bush (*Lindera benzoin*)

Blue Beech (*Carpinus caroliniana*)

Poison Ivy (*Rhus radicans*)

Virginia Creeper (*Parthenocissus quinquefolia*)

Blue-leaved Grape (*Vitis argentifolia*)

Climbing Bittersweet (*Celastrus scandens*)

HERBS

Virginia Spring Beauty (*Claytonia virginica*)

Toothwort (*Dentaria laciniata* and *D. diphylla*)

Wild Blue Phlox (*Phlox divaricata*)

Yellow Adder's-tongue (*Erythronium americanum*)

Large-flowered White Trillium (*Trillium grandiflorum*)

Mayapple (*Podophyllum peltatum*)

Blue Cohosh (*Caulophyllum thalictroides*)

Jack-in-the-Pulpit (*Arisaema triphyllum*)

Purple Trillium (*Trillium erectum*)

Squirrel Corn (*Dicentra canadensis*)

Wild Ginger (*Asarum canadense*)

Wild Leek (*Allium tricoccum*)

Dwarf Ginseng (*Panax trifolium*)

Smooth Yellow Violet (*Viola scabriuscula*)

Halberd-leaved Violet (*Viola hastata*)

Partridge-berry (*Mitchella repens*)

Sweet Cicely (*Osmorrhiza longistylis*)

White Baneberry (*Actaea alba*)

Wild Sarsaparilla (*Aralia nudicaulis*)

Black Snakeroot (*Cimicifuga racemosa*)

Indian Cucumber-root (*Medeola virginiana*)

Spotted Jewelweed (*Impatiens biflora*)

Pokeweed (*Phytolacca decandra*)

Enchanter's Nightshade (*Circaea lutetiana*)

FERNS AND CLUBMOSES

Christmas Fern (*Polystichum acrostichoides*)
Spinulose Shield Fern (*Dryopteris spinulosa*)
New York Fern (*Dryopteris noveboracensis*)
Hay-scented Fern (*Dennstaedtia punctilobula*)
Tree Club Moss (*Lycopodium obscurum*)
Running Ground Pine (*Lycopodium complanatum*)

THE HEMLOCK FOREST ASSOCIATION

The hemlock forest association is the prevalent type of forest in the northern portion of Cambria County and westward through the north-eastern part of Indiana County. It also occurs locally southward through Somerset County; and in isolated localities elsewhere in southwestern Pennsylvania, it still occurs in the moister and cooler parts of ravines and on hillsides having a northern exposure. It occurs on shallow, rocky, or cold, wet soils.

This forest is a mixture of hemlock, white pine, and northern hardwoods in which the conifers are dominant. The dense shade cast by such a forest prevents the development of any dense groundcover. Only a very few tolerant shrubs, flowering herbaceous plants, and ferns are found in the understory. Frequently there is only a deep carpet of fallen needles where the dominant trees are particularly dense.

Magnificent stands of white pine and hemlock formerly occurred in Cambria and Indiana counties, this forest probably representing the most southward extension of the once famous "Black Forest" of Pennsylvania. Today, in this country, one still sees occasional pine stump fences built there many years ago; but the great pine forests are gone. Wherever the present type of forest is destroyed the succession invariably becomes one of beech and sugar maple. Selective cutting of the larger hemlock trees in recent years is rapidly tending to eliminate this type of forest in favor of the latter type. The hemlock forest formerly occurred in or about many of the mountain top bogs, occupying the colder and poorly drained pockets, while the red oak-scarlet oak-black oak forest prevailed on the surrounding dry and rocky terrain.

HEMLOCK FOREST ASSOCIATION

TREES

Dominant:

Hemlock (*Tsuga canadensis*)
Beech (*Fagus grandifolia*)

Primary Associates:

Yellow Birch (*Betula lutea*)
Black Birch (*Betula lenta*)
Red Maple (*Acer rubrum*)
Sugar Maple (*Acer saccharum*)

Secondary Associates:

White Pine (*Pinus strobus*)
Tulip Tree (*Liriodendron tulipifera*)
Cucumber Tree (*Magnolia acuminata*)
Wild Black Cherry (*Prunus serotina*)
Fire Cherry (*Prunus pennsylvanica*)
Red Oak (*Quercus borealis* var. *maxima*)

White Ash (*Fraxinus americana*)
Juneberry (*Amelanchier canadensis*)

UNDERSTORY TREES, SHRUBS, AND WOODY VINES

Striped Maple (*Acer pennsylvanicum*)
Mountain Maple (*Acer spicatum*)
Hobblebush (*Viburnum alnifolium*)
Witch-hazel (*Hamamelis virginiana*)
Large-leaved Holly (*Ilex montana*)
Red-berried Elder (*Sambucus pubens*)
Black Chokeberry (*Aronia melanocarpa*)
Maple-leaved Viburnum (*Viburnum acerifolium*)
Wild Red Raspberry (*Rubus idaeus* var. *strigosus*)
Running Blackberry (*Rubus hispidus*)
Mountain Ash (*Sorbus americana*)
Rhododendron (*Rhododendron maximum*)

HERBS

False Lily-of-the-valley (*Maianthemum canadense*)
Foam Flower (*Tiarella cordifolia*)
Indian Cucumber-root (*Medeola virginiana*)
Yellow Clintonia (*Clintonia borealis*)
Wood Sorrel (*Oxalis acetosella*)
Round-leaved Violet (*Viola rotundifolia*)
Sweet White Violet (*Viola blanda*)
Long-spurred Violet (*Viola rostrata*)
Canada Violet (*Viola canadensis*)
Dalibarda (*Dalibarda repens*)
Jack-in-the-pulpit (*Arisaema triphyllum*)
Hepatica (*Hepatica triloba*)
Twisted-stalk (*Streptopus amplexifolius* and *S. roseus*)
Painted Trillium (*Trillium undulatum*)
Stemless Lady's Slipper (*Cypripedium acaule*)
Partridge-berry (*Mitchella repens*)

FERNS AND CLUBMOSSES

Christmas Fern (*Polystichum acrostichoides*)
Spinulose Shield Fern (*Dryopteris intermedia*)
New York Fern (*Dryopteris noveboracensis*)
Cinnamon Fern (*Osmunda cinnamomea*)
Royal Fern (*Osmunda regalis*)
Shining Club Moss (*Lycopodium lucidulum*)
Running Ground Pine (*Lycopodium clavatum*)
Tree Club Moss (*Lycopodium obscurum*)

THE HEMLOCK-BIRCH-RHODODENDRON ASSOCIATION

The hemlock-birch-rhododendron association occurs in the narrow, V-shaped valleys, along the cold, fast-flowing, and rocky-bedded streams of the mountains—the type of stream which is inhabited by the native brook trout. Usually there is a more or less dense understory of rhododendron (*Rhododendron maximum*), and occasionally a scattering of other shrubs, beneath the dominant hemlocks, birches, and a few other trees. It is a relatively minor plant association, but one which is so common and typical of our mountain regions that its inclusion seems most desirable here. This association frequently occupies a very narrow strip along either bank of the stream, while a short distance away, on the terrace above the stream bed, the forest will be of an entirely different type.

HEMLOCK-BIRCH-RHODODENDRON ASSOCIATION

TREES

Dominant:

- Hemlock (*Tsuga canadensis*)
- Black Birch (*Betula lenta*)
- Yellow Birch (*Betula lutea*)

Associates:

- Sugar Maple (*Acer saccharum*)
- Red Maple (*Acer rubrum*)
- Tulip Tree (*Liriodendron tulipifera*)
- Cucumber Tree (*Magnolia acuminata*)
- Beech (*Fagus grandifolia*)
- Basswood (*Tilia americana*)
- White Ash (*Fraxinus americana*)
- White Pine (*Pinus strobus*)

SHRUBS

Dominant:

- Rhododendron (*Rhododendron maximum*)

Associates:

- Witch-hazel (*Hamamelis virginiana*)
- Hoary Alder (*Alnus incana* var. *glauca*)
- Striped Maple (*Acer pennsylvanicum*)
- Mountain Maple (*Acer spicatum*)
- Smooth Azalea (*Rhododendron arboreum*)
- Hobble-bush (*Viburnum alnifolium*)
- Winterberry (*Ilex verticillata*)

THE SYCAMORE-AMERICAN ELM-SILVER MAPLE ASSOCIATION

Over the greater part of southwestern Pennsylvania, exclusive of the mountainous regions, the forest found on the floodplains of the creeks and rivers is the sycamore-American elm-silver maple association. The sycamore (*Platanus occidentalis*) is perhaps the most conspicuous component of the association. It attains a size unequaled by any other tree found in this area. It ascends most of the stream valleys into the foothills of the mountains. On Lynn Run, on the western slope of the Laurel Hill Mountain it occurs about half way up the mountain to an elevation of about 1,900 feet. The American elm (*Ulmus americana*) is second only to the sycamore as a conspicuous component of this floodplain forest.

In the extreme western and southwestern part of this region, along the streams tributary to the Ohio River and the Monongahela, occur certain species of plants which are characteristic of the Mississippi Valley flora. The Ohio buckeye (*Aesculus glabra*), sweet buckeye (*Aesculus octandra*), ash-leaved maple (*Acer negundo*), and several species of herbaceous plants locally common in the stream valleys fall into this category.

Jennings (1939) states that about thirty species of plants native to the southern Alleghenies reach their northern limit in the middle southernmost part of Western Pennsylvania, centering mainly around Fayette County. Among them are the oil nut (*Pyrularia pubera*), smooth azalea (*Rhododendron arboreum*), umbrella magnolia (*Magnolia tripetala*), sourwood (*Oxydendron arboreum*), and a number of herbaceous species. Apparently these plants have entered the region by migrating up the Castleman and the Youghiogheny rivers.

SYCAMORE—AMERICAN ELM—SILVER MAPLE ASSOCIATION

TREES

Dominant:

Sycamore (*Platanus occidentalis*)
American Elm (*Ulmus americana*)
Silver Maple (*Acer saccharinum*)

Associates:

Black Willow (*Salix nigra*)
Red Maple (*Acer rubrum*)
Ash-leaved Maple (*Acer negundo*)
Swamp White Oak (*Quercus bicolor*)
Bur Oak (*Quercus macrocarpa*)
Blue Beech (*Carpinus caroliniana*)
Black Ash (*Fraxinus nigra*)
Ohio Buckeye (*Aesculus glabra*)
Yellow Buckeye (*Aesculus octandra*)
Shingle Oak (*Quercus imbricaria*)

SHRUBS AND WOODY VINES

Willows (*Salix cordata*, *S. fragilis*, *S. fluviatilis*)
Smooth Alder (*Alnus rugosa*)
Ninebark (*Physocarpus opulifolius*)
Silky Dogwood (*Cornus amomum*)
Button-bush (*Cephalanthus occidentalis*)
Spicebush (*Lindera benzoin*)
Black Haw (*Fiburnum prunifolium*)
Riverbank Grape (*Vitis riparia*)
Virginia Creeper (*Parthenocissus quinquefolia*)
Poison Ivy (*Rhus radicans*)
Arrow-wood (*Fiburnum dentatum*)

HERBS

Virginia Bluebell (*Mertensia virginica*)
Greek Valerian (*Polemonium reptans*)
Skunk Cabbage (*Symplocarpus foetidus*)
Sessile Trillium (*Trillium sessile*)
Striped Violet (*Viola striata*)
Bulbous Cress (*Cardamine bulbosa*)
Lamb's Lettuce (*Valerianella chenopodifolia*)
Pursh's Phacelia (*Phacelia purshii*)
Panicked Phlox (*Phlox paniculata*)
Meadow Rue (*Thalictrum polygamum*)
Arrow-leaved Tear-thumb (*Polygonum arifolium*)
Cow Parsnip (*Heracleum lanatum*)
Poison Hemlock (*Conium maculatum*)
Golden Ironweed (*Actinomeris alternifolia*)
Joe Pye Weed (*Eupatorium purpureum*)
Ironweed (*Vernonia noveboracensis*)
Spotted Jewel-weed (*Impatiens biflora*)
Yellow Cone-flower (*Rudbeckia laciniata*)
Ten-petalled Sunflower (*Helianthus decapetalus*)
Panicked Aster (*Aster paniculatus*)
Crooked-stemmed Aster (*Aster prenanthoides*)
Virginia Clematis (*Clematis virginiana*)

LAND USE

Agriculture: The greater part of the land area in southwestern Pennsylvania, outside of the mountains, has at one time or another been devoted to farming. An analysis of the accompanying tables (Tables 1 to 6) indicates that there has been a general decline in the percentage of the land area thus devoted during the past half century. It is only partially explained by the conversion of the land to other uses. Expanding urban communities account for the decrease locally, particularly in Allegheny County. In some instances it can be explained by the expansion of other industries, mining in particular; but often it may be accounted for simply in terms of economic necessity. Some of these land areas never should have been farmed, but much good land has been ruined by mismanagement and consequent soil erosion. In nearly all of the counties there are today considerable acreages of abandoned farm fields in various stages of reversion to forest.

Use of the land for agricultural purposes has a definite but variable effect upon mammal populations. Lands which were formerly in forest were of necessity cleared, thus adversely affecting the forest species of wildlife; but, at the same time, it was distinctly advantageous to grassland species. Land areas which are too intensively farmed, or too heavily grazed by domestic stock, offer little inducement to most wild mammals aside from a few mice and shrews. Both the cottontail rabbit and the woodchuck find their optimum habitat in agricultural areas, provided sufficient cover is available for them. Both of these animals are far more common in farming regions than in strictly wooded ones. The abandonment of farm lands simply means that there is just that much less optimum habitat for these mammals; for, although the amount of cover may actually increase, there is a corresponding decrease in the form of food—fewer grains, and grasses, and clovers, for instance.

Most of the agricultural land in this region is devoted to general farming. At one time sheep raising was the most important industry in Washington and Greene counties, but there were less than half as many sheep in these two counties in 1945 as there were in 1910. Dairying has increased in importance in all counties, except possibly Allegheny County, within the past half century, as there has been a growing demand for milk products in the expanding urban communities. The principal grain crops produced in this region are corn, oats, and winter wheat. Trends in the production of these crops are shown in the accompanying tables. Locally, buckwheat and potatoes are grown rather extensively. Truck farming is an important industry in some sections, particularly in those close to large urban communities.

Mining: Bituminous coal is mined to some extent in all of the counties of southwestern Pennsylvania but is most extensive in parts of Allegheny, Washington, Greene, Westmoreland and Fayette counties. Deep pit mining has apparently little direct effect upon the habitats of mammals, aside from the resultant pollution of the streams by mine drainage. The latter effect, however, may be extensive and devastating. Many miles of the regional streams have been reduced to utter barrenness by acid waters from mines, and the habitat of aquatic and semi-

aquatic species of wildlife has been destroyed. Within recent years the strip-mining of coal has become increasingly prevalent, and large areas of farm land have been destroyed. Strip-mining is done only where the coal beds lie close enough to the surface to make the operations economically sound. Overlying strata of rock are removed by power shovels. As a rule all of this material is piled in heaps alongside of the trenches; the top soil is buried beneath the unproductive sub-soil and rock debris, and all too often it is just left in this condition. Strip-mined areas are not only unsightly; they are often just as barren. Unless the resultant dumps are at least partially levelled off and replanted, it may be many years before natural vegetation will succeed in covering them. Such areas are practically devoid of wildlife. They can, however, be converted into excellent wildlife habitat by the judicious planting of cover crops, food-producing shrubs, and various trees. Excellent stands of sweet clovers (*Melilotus*) have resulted on partially smoothed over dumps in Washington County, following the application of lime, fertilizer, and seed.

Forest Industries: The production of saw timber is only of local importance inasmuch as most of the forests have not attained saw timber size. Some small sawmills are engaged in converting isolated small tracts of large trees, or cull trees from prior lumbering operations, into timbers. In Greene County many of the remaining and scattered stands of old growth white oak are being cut for the production of barrel staves. The production of mine props is the most important single forest industry throughout most of the region. Much of the potential saw timber is consequently being destroyed, for in most cases the land is clear cut. Forest development on such areas will, of course, be retarded; but the net result is definitely favorable to mammals such as the white-tailed deer and the cottontail rabbit. The resultant production of sprout growth, seedlings, shrubs, and herbaceous vegetation provides them with an abundance of food for several seasons; and this, combined with the brush accumulated by the cutting, affords excellent cover.

TABLE 1
PERCENTAGE OF LAND AREA IN FARMS

County	1910	1920	1925	1930	1935	1940	1945
Allegheny	66.5	54.1	51.1	40.9	41.0	34.1	34.9
Cambria	49.7	43.3	39.0	38.9	41.7	39.4	42.4
Fayette	62.6	55.4	53.1	48.7	53.3	44.3	50.5
Greene	96.5	95.0	87.1	88.5	91.8	84.2	83.0
Indiana	81.6	74.1	65.7	59.0	65.2	58.8	60.0
Somerset	71.8	67.1	64.8	62.0	65.8	56.0	58.3
Washington	91.3	85.6	80.8	79.2	85.3	75.7	78.2
Westmoreland	74.2	73.1	64.5	57.5	61.1	51.2	58.8
State (Total)	64.8	61.5	56.8	53.4	55.3	50.6	52.1

TABLE 2
CORN FOR ALL PURPOSES (ACRES)

<i>County</i>	<i>1910</i>	<i>1919</i>	<i>1924</i>	<i>1929</i>	<i>1934</i>	<i>1939</i>	<i>1944</i>
Allegheny	20,408	16,726	13,131	11,325	12,051	11,486	11,941
Cambria	7,897	6,883	8,166	6,909	8,214	8,999	9,352
Fayette	22,736	18,563	13,813	14,150	17,237	16,648	17,353
Greene	24,976	20,783	10,717	15,123	16,589	14,654	11,067
Indiana	25,796	21,732	21,347	19,657	21,499	21,878	22,975
Somerset	17,033	16,612	20,247	19,629	19,966	22,245	24,184
Washington	36,625	30,623	22,847	24,008	28,246	26,787	25,082
Westmoreland	39,489	35,296	29,996	29,066	30,737	30,296	31,060

TABLE 3
OATS—THRESHED OR COMBINED (ACRES)

<i>County</i>	<i>1910</i>	<i>1919</i>	<i>1924</i>	<i>1929</i>	<i>1934</i>	<i>1939</i>	<i>1944</i>
Allegheny	20,681	18,850	11,997	10,525	7,859	8,097	8,525
Cambria	14,800	15,368	16,277	12,723	12,686	12,119	13,315
Fayette	15,130	16,301	12,516	11,661	11,314	11,258	11,349
Greene	14,282	15,415	7,501	7,568	6,305	6,214	4,173
Indiana	25,452	25,368	22,030	20,772	20,479	20,296	20,372
Somerset	34,872	38,042	33,666	33,529	32,707	31,819	33,631
Washington	28,701	31,076	20,424	19,574	17,711	18,588	17,107
Westmoreland	36,948	36,100	28,316	25,215	25,530	24,660	23,327

TABLE 4
WINTER WHEAT—THRESHED OR COMBINED (ACRES)

<i>County</i>	<i>1910</i>	<i>1919</i>	<i>1924</i>	<i>1929</i>	<i>1934</i>	<i>1939</i>	<i>1944</i>
Allegheny	13,252	16,254	8,808	5,511	5,665	5,939	5,999
Cambria	3,252	5,444	3,974	2,583	4,100	4,986	5,510
Fayette	13,248	13,573	6,204	4,811	8,230	8,719	7,623
Greene	13,993	17,783	4,303	2,461	5,382	5,390	3,375
Indiana	17,045	20,571	13,817	9,573	14,886	13,316	14,733
Somerset	11,420	16,831	8,369	7,285	10,409	11,017	10,292
Washington	25,125	33,560	13,215	8,293	11,405	13,155	11,370
Westmoreland	28,290	35,201	21,148	15,138	19,111	19,203	16,895

TABLE 5
CATTLE

County	1910	1920	1925	1930	1935	1940	1945
Allegheny	26,825	20,179	18,518	16,785	14,757	12,120	14,061
Cambria	14,085	13,177	12,461	12,451	12,831	10,455	13,521
Fayette	19,859	16,243	16,009	18,575	20,137	17,394	24,764
Greene	25,775	28,029	20,291	20,292	20,869	18,907	24,288
Indiana	22,748	21,200	18,656	22,055	23,385	20,402	28,524
Somerset	34,338	33,680	32,438	39,010	36,747	34,453	46,748
Washington	42,918	41,722	36,012	42,749	44,596	39,936	52,287
Westmoreland	36,209	34,472	31,750	37,767	40,829	35,626	43,320

TABLE 6
SHEEP AND LAMBS

County	1910	1920	1925	1930	1935	1940	1945
Allegheny	6,544	3,161	2,725	4,279	3,331	2,150	1,751
Cambria	4,410	2,328	1,427	2,654	1,570	1,051	1,199
Fayette	10,488	6,218	5,680	8,018	4,621	3,184	2,557
Greene	158,275	122,793	118,089	121,772	140,598	108,213	80,335
Indiana	16,069	7,704	4,350	10,187	6,815	4,248	3,817
Somerset	14,499	7,481	4,638	9,746	6,238	3,777	2,924
Washington	196,005	117,936	104,421	106,595	101,740	78,502	56,399
Westmoreland	14,764	7,593	5,383	7,982	5,868	2,937	3,951

ECOLOGICAL DISTRIBUTION OF MAMMALS

For many years an attempt has been made to explain the distribution of birds and mammals on the basis of Merriam's life-zone concept, and life zone maps have customarily accompanied most regional fauna reports. This life-zone concept is based upon two factors—temperature and humidity—governing the distribution of animal life. Of these, temperature has usually been regarded as the most important factor involved. Three of these life zones have long been supposed to occur within the present region. The Carolinian Faunal Area of the Upper Austral Zone occurs throughout that portion of the region to the west of the Allegheny Mountains Section as far north as the northern part of Allegheny County and the southeastern part of Indiana County. The higher portion of the Allegheny Mountains Section, including the elevated inter-mountain plateau, has been regarded as being within the Canadian Zone; while between the two lies a belt within the Transition Zone represented by the Alleghenian Faunal Area. (Fig. 5.)

Many recent workers have found fault with this life-zone concept, and an attempt has more recently been made to fit the distribution of animals into a biome concept. According to Shelford, biomes are "the largest plant and animal communities in dynamic equilibrium in the final climax stage". (Quoted by Peterson, 1942.) If we were to adopt this

concept, our region would fall into two ecological classifications: one of which, practically conforming to the Pittsburgh Section of our Appalachian Plateau Province, would constitute the Deciduous Forest Biome; and the other, covering the Allegheny Mountains Section would be considered as the Coniferous-Deciduous Forest Ecotone. Ecotones are merely broad transitional areas or zones between the larger biomes. In this case our mountain and high plateau forests are regarded as intermediate between the true northern Coniferous Forest Biome, characterized by the dominance of spruce and balsam fir, and the hardwood forests of the more southern Deciduous Forest Biome.

Our region is notably weak in typically Canadian Zone birds and mammals; but the Alleghenian Faunal Area, being strictly a transitional zone, should very naturally be expected to combine elements of both the Canadian and Carolinian Faunas. The slate-colored junco, Canada warbler, northern waterthrush, black-throated blue warbler and the magnolia warbler are usually considered as typical Canadian Zone species; yet they all occur, at least locally, as breeding species in our Allegheny Mountains Section. In many places, however, they nest in proximity to such typically Carolinian species as the hooded warbler, yellow-breasted chat, tufted titmouse, Carolina wren, or the cardinal. Mammals of definite northern or Canadian Zone affinity which are cur-

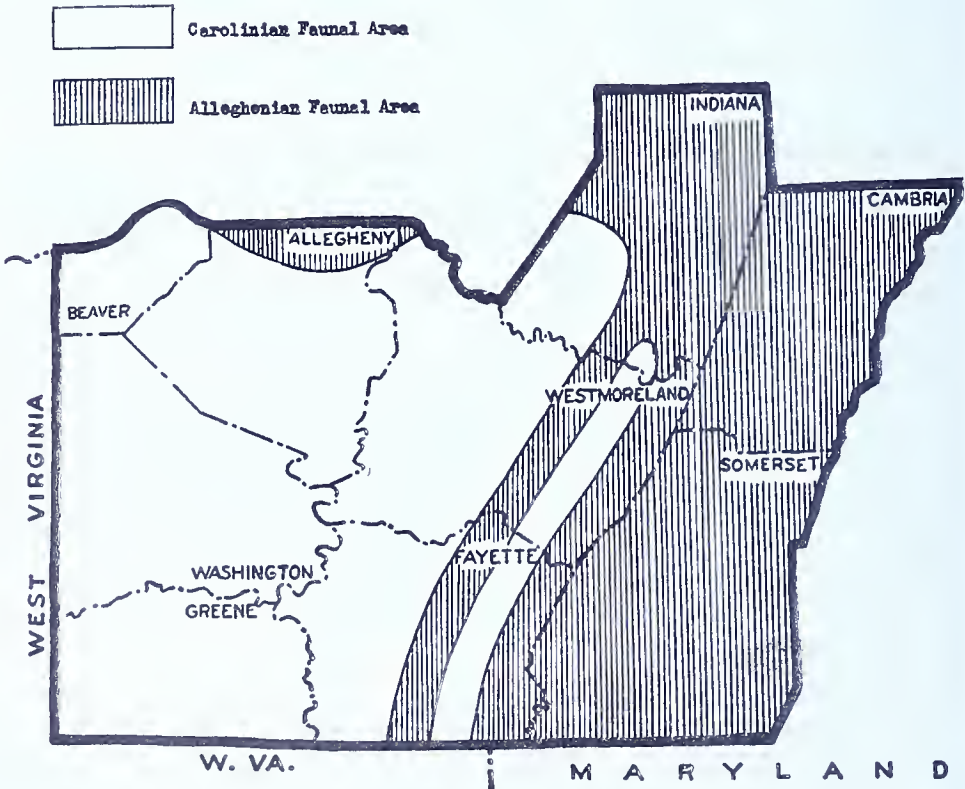


FIG. 5. A FAUNAL MAP OF SOUTHWESTERN PENNSYLVANIA

rently more or less common throughout the Allegheny Mountains Section include the red-backed mouse, cloudland deer mouse, woodland jumping mouse, and the masked shrew; none of which is known to occur in the Carolinian Zone province. On the other hand, practically all of the species of mammals which occur in the Carolinian Zone are known to occur, to some extent, in the Allegheny Mountains Section. If any typically Canadian Zone faunal areas existed in our mountain highlands in the remote past, they are by no means obvious today. For this reason it seems best to consider our entire Allegheny Mountains Section as having a typically transitional or Alleghenian Fauna.

The biome concept, being based upon climax associations, is attended with many complications and apparent anomalies in a region such as ours. Actually, in this region, the Deciduous Forest Biome and the Carolinian Zone have about the same general distribution; and the same might be said for the Coniferous-Deciduous Forest Ecotone, and the Alleghenian Faunal Area, both of which are primarily confined to the Allegheny Mountains Section. Much of our land area, however, has been vastly altered. Forests have been cleared away to make room for farms and urban communities. Grasslands in the form of meadows, pastures, and golf courses are prevalent today where unserried ranks of trees grew a hundred or a hundred and fifty years ago. What wooded areas remain are frequently too isolated or too altered in character to meet the needs of many forest species of birds and mammals which formerly inhabited the region—the wild turkey, elk, bison, and cougar, for example. But, on the other hand, there are many other species which have evidently benefited by the changes brought about by man. The prairie horned lark is typically a bird of the midwestern Grassland Biome, but it now occurs quite commonly throughout our region wherever there are fairly extensive man-made grasslands. A similar case might be cited among mammals; for the prairie deer mouse has likewise extended its range eastward through our agricultural areas, probably following the highways from one such area to another until it has succeeded in crossing our mountain ridges. The meadow mouse, woodchuck, and the cottontail rabbit have all most certainly profited by greatly expanded grassland habitats; but there is just so much less optimum habitat for the gray squirrel since the once extensive forests of big trees have disappeared.

Habitat niches are of utmost importance in defining the distribution of most—but not all—species of mammals. The meadow mouse, for example, dwells in grassland habitats be they Carolinian or Alleghenian. Grass, in this case, seems to be the principal factor influencing its distribution. Optimum habitat for the meadow mouse is unmowed meadow and swale where there are rank growths of grasses, sedges, and other herbaceous plants. It often occurs even in small and isolated grassy areas surrounded for miles by dense woodland. No doubt the original home of this mouse was in the small natural openings in the forests, and in the open and isolated swale and bog areas. But when man made grassy habitats much more extensive, they were quick to respond to the favorable change in their environment.

Many characteristically forest species are not by any means uniformly distributed throughout our forest areas. The wood rats must have rocky

cliffs, masses of huge residual boulders, or piles of slide rock in which to build their nests and live their lives. Inasmuch as these features do not occur everywhere in our forested areas, the wood rat is quite local in its distribution. Red-backed mice and cloudland deer mice both seem to require a degree of moistness and coolness. They exhibit a very marked preference for those particular areas where mossy rocks occur, and where ferns grow in great profusion. We have found most of our woodland jumping mice along the typical mountain trout streams, with their mixed forest of hemlocks, birches and thickets of rhododendrons.

On the other hand there are a few mammals which seem to be at home in a very wide variety of habitats. The short-tailed shrew (*Blarina brevicauda*) has, perhaps, the widest distribution of any of our mammals. It seems to have no well-defined habitat preferences. It occurs in both fields and in woodlands, in both moist or dry situations; and it is common at all altitudes. Many other species do not seem to be limited in their distribution merely by temperature or humidity factors, nor to any extent by the prevailing type of vegetation; but rather by some complex combination of many, and often subtle, factors which go to make up the habitat niche.

In Table 7 we have listed all of the species of mammals, except the bats and a few of the rarer forms, giving the pertinent facts concerning their general distribution and habitat preferences. Fuller discussions regarding the habitats are given under the treatment of each species in the following pages.

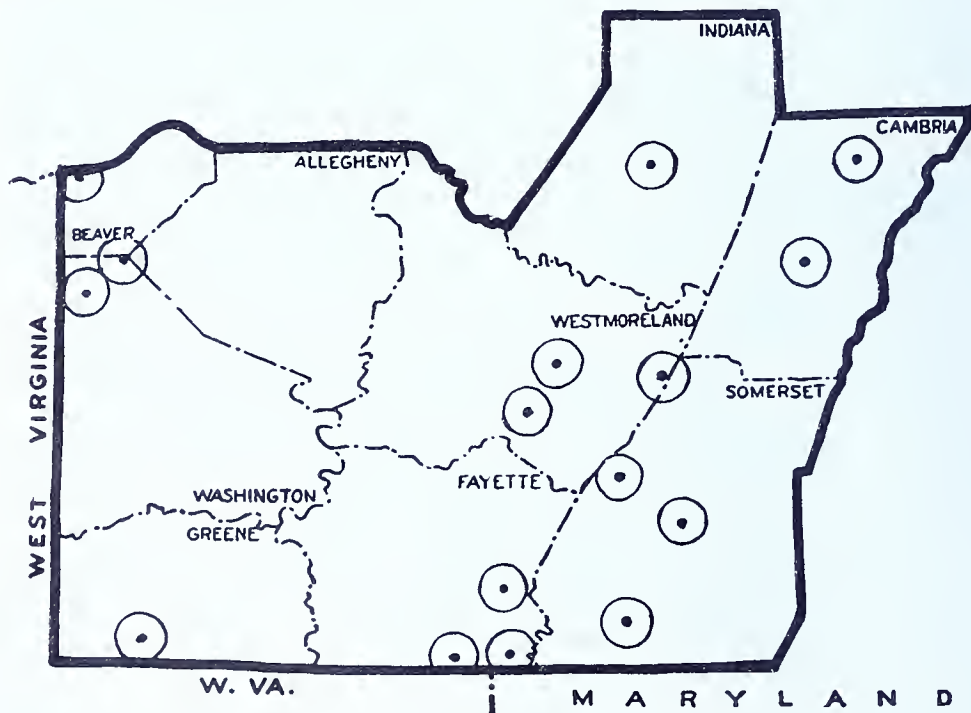


FIG. 6. LOCATION OF AREAS STUDIED AND TRAPPED DURING SURVEY

TABLE 7
ECOLOGICAL DISTRIBUTION OF THE MAMMALS

	Forest		Non-forest					Special factors apparently essential in the habitat, or evident habitat preferences.
	Deciduous (Carolinian)	Coniferous-Deciduous (Alleghenian)	Crop fields	Meadow and grassland	Abandoned field: grass-weed stage	Abandoned field: shrub thicket stage	Sewales and marshland	
Opossum	x	x	f	f	f	f	f	Bottomland and rocky places preferred.
Brewer's Mole	x	x	x	x	x	x		Prefers deep, friable soils.
Star-nosed Mole		x		x	x	x	x	Wet areas or mucky soils.
Masked Shrew		x	f		f	f	f	Cool, moist and usually rocky sites.
Smoky Shrew	x	x	f		f	f		Cool, moist and usually rocky sites.
Small Short-tailed Shrew			x	x				Short grass.
Short-tailed Shrew	x	x	x	x	x	x	x	Groundcover of any kind suffices.
Raccoon	x	x	f	f	f	f	f	Large den trees or rock outcrops.
Least Weasel				x	x	x		Prefers open areas and thicket.
New York Weasel	x	x	f	x	x	x		Stumps, logs or rocks for den sites.
Mink	x	x		f	f	f	x	Watercourses preferred.
Skunk	x	x	f	x	x	x		Prefers forest edge and brushland
Red Fox	x	x	f	f	f	x	f	Prefers broken forest and field.
Gray Fox	x	x	f	f	f	x	f	Prefers heavy woods and brush.
Woodchuck	x	x	x	x	x	x		Herbaceous vegetation.
Chipmunk	x	x	f		f	x		Presence of rocks, stumps and brush.
Red Squirrel	f	x	f			f		Prefers coniferous forest.
Gray Squirrel	x	x	f			f		Mast producing trees.
Fox Squirrel	x		f			f		Mast producing trees in open groves.
Southern Flying Squirrel	x	x						Presence of natural cavities in trees.
Cloudland Deer Mouse		x				f		Cool, moist, usually rocky sites.
Prairie Deer Mouse			x	x	f			Cultivated land; sparse vegetation.
White-footed Mouse	x	x	f	f	x	x		Wooded or semi-wooded areas.
Allegheny Wood Rat		x						Rock cliffs and slide rock.
Lemming Mouse			f	x	x	x		Grass cover.
Red-backed Mouse		x				f		Cool, moist, rocky sites.
Meadow Mouse			f	x	x	x	x	Presence of grasses and sedges.
Pine Mouse	x	x						Loam or sandy soils.
Muskrat			f	x	x	x	x	Herbaceous vegetation and water.
Meadow Jumping Mouse			x	x	x	x	x	Moist meadow and thicket.
Woodland Jumping Mouse		x						Cool, moist woods.
Cottontail Rabbit	f	f	f	x	x	x	x	Herbaceous plants; brush for cover.
White-tailed Deer	x	x	f	f	f	x	f	Woody browse plants.

x—Indicates usual habitat in which the animal lives.

f—Indicates habitat types often frequented in quest for food but rarely, if ever, continually inhabited by the species.

METHODS AND PROCEDURES

Field work in southwestern Pennsylvania was begun in August 1947, and completed in June 1949. Fig. 6 shows the areas which were intensively studied and trapped during the course of the survey; and a table

of exact locations is given at the end of this chapter. An effort was made to include as many different ecological types as possible. The study areas were chosen primarily because of their relationship to topographical features; the major drainage pattern, and the differences in altitude in various parts of the region being the most important factors. Each of these study areas was intensively trapped.

Permanent headquarters were located at Laughlintown, Westmoreland County—a most advantageous point from which to study the mammals of Laurel Hill Mountain, Chestnut Ridge and of the intervening Ligonier Valley. Work in this area was largely confined to the winter seasons, but it was extended into the spring of 1949. The other areas were studied during the spring, summer and fall months. Between one and two months were usually devoted to field work in each of the various study areas.

As a part of the winter work many trappers and fur dealers were interviewed. A fairly large series of intestinal tracts of predatory fur-bearers, as well as much valuable data, were obtained from this source.

A representative series of mammals from each of the study areas were prepared as museum skins. Additional data were recorded from a much larger number of specimens which were either subsequently discarded or cataloged only as skull specimens. Parasites were preserved from many of the animals, but most of these await subsequent study by various specialists. Ecological data were secured at every trapline, and daily notes of mammal observations were kept by each member of the field party. All of this material has been deposited in the Section of Mammalogy at the Carnegie Museum, Pittsburgh, Pennsylvania.

LIST OF STUDY AND TRAPPING LOCALITIES

BEAVER COUNTY:

1½ mi. E of Georgetown	Apr. 7-9, 1948
½ mi. E of Georgetown	Apr. 26-30, 1948
4 mi. ENE of Frankfort Springs	Apr. 7-10, 1948
4 mi. E. Frankfort Springs	Apr. 7-10; May 7-13, 1948

CAMBRIA COUNTY:

5 mi. NNE of Ebensburg	July 12-Aug. 20, 1948
4 mi. N of Ebensburg	July 12-16, 1948
5½ mi. NE of Ebensburg	July 19-24, 26-30, 1948
3 mi. N of Ebensburg	Aug. 2-6, 1948
1¾ mi. SW of Patton	Aug. 9-14, 1948
2 mi. WSW of Patton	Aug. 9-14, 1948
2½ mi. S of Patton	Aug. 16-20, 1948

FAYETTE COUNTY:

¼-½ mi. S of Ohiopyle	Oct. 26-31, 1947
4 mi. SE of Ohiopyle	May 18-24, 1948
2 mi. NW of Markleysburg	May 17-July 2, 1948
2½ mi. E of Markleysburg	June 1-4, 1948
2½ mi. W of Markleysburg	June 1-5; June 28-July 2, 1948
2½ mi. ENE of Markleysburg	June 28-July 2, 1948
5 mi. SSW of Farmington	June 14-18, 1948
3½ mi. SW of Farmington	June 21-25, 1948

GREENE COUNTY:

1/2 mi. N of Pine Bank	Oct. 4-28, 1948
1 1/2 mi. N of Pine Bank	Oct. 5-8, 1948
4 mi. NW of Pine Bank	Oct. 11-15, 1948
1 3/4 mi. NNW of Pine Bank	Oct. 11-15, 1948
3 1/2 mi. NNW of Pine Bank	Oct. 12-15, 1948
3 mi. NW of Pine Bank	Oct. 18-22, 1948
3/4 mi. SE of Pine Bank	Oct. 19-22, 1948

INDIANA COUNTY:

1/2 mi. E of Indiana	Sept. 8-Oct. 1, 1948
3 mi. ESE of Indiana	Sept. 21-24, 1948
4 mi. ESE of Indiana	Sept. 27-30, 1948
6 mi. ESE of Indiana	Sept. 20-24, 1948
8 1/2 mi. SE of Indiana	Sept. 28-Oct. 1, 1948
9 mi. SE of Indiana	Sept. 14-18, 21-22, 1948
2 1/2 mi. SSE of Indiana	Sept. 28-Oct. 1, 1948

SOMERSET COUNTY:

4 mi. SW of Somerset	Aug. 8-Sept. 26, 1947
2 mi. SW of Somerset	Aug. 23-Sept. 1, 1947
1 mi. S of Somerset	Sept. 2-13, 1947
5 mi. SW of Somerset	Sept. 13-26, 1947
2 mi. SE of Somerset	Sept. 16-21, 1947
8 mi. NW of Somerset	Sept. 26-Oct. 24, 1947
6 1/2 mi. WNW of Somerset	Oct. 11-20, 1947
10 mi. NW of Somerset	Oct. 22-24, 1947
5 mi. SSW of Confluence	May 24-27, 1948
4 1/2 mi. W of Jennerstown	Mar. 22-27, 1948
5 1/2 mi. WSW of Jennerstown	Mar. 25-29, 1948
5 mi. WSW of Jennerstown	Nov. 15-20, 1948
4 mi. NW of Salisbury	June 7-12, 1949
4 1/2 mi. NW of Salisbury	May 31-June 5, 1949
5 mi. NW of Salisbury	June 1-7, 1949
6 1/4 mi. NW of Salisbury	June 6-13, 1949

WASHINGTON COUNTY:

2 3/4 mi. NNW of Burgettstown	Apr. 13-17, 20-23, 1948
6 1/2 mi. NNE of Burgettstown	Apr. 15-23, 1948
3 mi. NW of Burgettstown	Apr. 19-23, 1948

WESTMORELAND COUNTY:

6 mi. SSE of Laughlintown	Dec. 15-22, 1947; Mar. 15-19, 1948; Nov. 8-15, 20-24, 1948
1 mi. ENE of Laughlintown	Dec. 26, 1947-Jan. 16, 1948; Jan. 30-Feb. 7, 1949
3 mi. NW of Laughlintown	Feb. 19-21, 1948
7 3/4 mi. S of Laughlintown	Mar. 15-20, 1948
4 mi. SE of Laughlintown	Mar. 18-26, 1948; May 2-9, 1949
1/4 mi. NW of Laughlintown	Dec. 7-11, 1948
3 1/2 mi. NE of Laughlintown	Jan. 22-28, 1949
1 3/4 mi. W of Laughlintown	Mar. 3-7, 14-25, 1949
1/2 mi. SE of Laughlintown	Apr. 10-29, 1949
1 1/2 mi. SSE of Laughlintown	Apr. 18-29, 1949
1 mi. SSE of Rector	Apr. 4-9, 1949
1 1/2 mi. SSE of Rector	Mar. 8-11, 1948
2 mi. SSE of Rector	Feb. 25-Mar. 6, 1948; Dec. 30, 1948-Jan. 11, 1949; Feb. 7-22, 1949
2 1/2 mi. SSE of Rector	Jan. 16-Feb. 15, 1948

3 mi. SSE of Rector	Feb. 18-25, 1948; Dec. 13-21, 1948; Feb. 8-21, 1949
4½ mi. SSE of Rector	Jan. 9-22, 1949
5 mi. SSE of Rector	Feb. 14-22, 1949
1½ mi. SW of Rector	Dec. 28, 1948-Jan. 3, 1949
½ mi. NE of Rector	Mar. 7-23, 1949
1¼ mi. S of Ligonier	Mar. 4-10, 1949
3¾ mi. NW of Stahlstown	Mar. 28-Apr. 2, 1949
4¾ mi. NW of Stahlstown	Mar. 28-Apr. 2, 1949
5½ mi. NW of Stahlstown	Mar. 28-Apr. 2, 1949
4 mi. SE of Latrobe	Apr. 3-14, May 4-13, 1949

CHECK LIST OF THE RECENT WILD MAMMALS OF SOUTHWESTERN PENNSYLVANIA

The following check list includes all of the species and subspecies of wild mammals which have been recorded in southwestern Pennsylvania, exclusive of the fossil forms. Species which were collected or observed during the period of the present survey are indicated by an asterisk (*). Species indicated by a dagger (†) have been taken by recent collectors. Extinct species (Rhoads, 1903; Gilmore, 1946; Shoemaker, 1917, 1919, 1949) are in parentheses. Species indicated by question marks (?) have not as yet been recorded in the region covered by this report, but occur very close to its boundaries.

Order: *Marsupialia* (Marsupials)

Family: *Didelphidae* (Opossums)

Didelphis virginiana virginiana (Kerr) Virginia Opossum*

Order: *Insectivora* (Moles and Shrews)

Family: *Talpidae* (Moles)

Parascalops breweri (Bachman) Hairy-tailed Mole*

Condylura cristata cristata (Linnaeus) Star-nosed Mole

Family: *Soricidae* (Shrews)

Sorex cinereus cinereus (Kerr) Masked Shrew*

Sorex fumeus fumeus (Miller) Smoky Shrew*

Sorex dispar (Batchelder) Gray Long-tailed Shrew*

Sorex palustris subsp. ? Water Shrew*

Cryptotis parva parva (Say) Little Short-tailed Shrew*

Blarina brevicauda brevicauda (Say) Short-tailed Shrew*

Order: *Chiroptera* (Bats)

Family: *Vespertilionidae*

Myotis lucifugus lucifugus (LeConte) Little Brown Bat*

Myotis subulatus leibii (Audubon & Bachman) Least Brown Bat*

Myotis sodalis (Miller & Allen) Indiana Bat*

Myotis keenii septentrionalis (Trouessart) Say's Bat*

Pipistrellus subflavus subflavus (F. Cuvier) Georgia Pigmy Bat*

Lasionycteris noctivagans (LeConte) Silver-haired Bat*

Eptesicus fuscus fuscus (Beauvois) Big Brown Bat*

Lasiurus borealis borealis (Muller) Red Bat*

Lasiurus cinereus (Beauvois) Hoary Bat (†)

Nycticeius humeralis (Rafinesque) Twilight Bat (†)

Order: *Carnivora* (Carnivorous Mammals)

Family: *Ursidae* (Bears)

Ursus americanus americanus (Pallas) American Black Bear*

Family: <i>Procyonidae</i> (Raccoons)	
<i>Procyon lotor lotor</i> (Linnaeus)	Eastern Raccoon*
Family: <i>Mustelidae</i> (Weasels, Skunks, etc.)	
<i>Mustela rixosa allegheniensis</i> (Rhoads)	Allegheny Least Weasel*
<i>Mustela frenata noveboracensis</i> (Emmons)	New York Weasel*
<i>Mustela vison vison</i> (Schreber)	Northeastern Mink (?)
<i>Mustela vison mink</i> (Peale & Beauvois)	Southeastern Mink*
<i>Lutra canadensis canadensis</i> (Schreber)	Northeastern Otter (?)
<i>Mephitis mephitis nigra</i> (Peale & Beauvois)	Eastern Skunk*
Family: <i>Canidae</i> (Foxes and Wolves)	
<i>Vulpes fulva</i> (Desmarest)	Eastern Red Fox*
<i>Urocyon cinereoargenteus cinereoargenteus</i> (Schreber)	Eastern Gray Fox*
<i>Canis latrans latrans</i> (Say)	Coyote (†)
(<i>Canis lupus lycaon</i> (Schreber)	Timber Wolf)
Family: <i>Felidae</i> (Cats)	
<i>Lynx rufus rufus</i> (Schreber)	Eastern Bobcat*
(<i>Lynx canadensis canadensis</i> (Kerr)	Canada Lynx)
(<i>Felis concolor cougar</i> (Kerr)	Cougar)
Order: <i>Rodentia</i> (Rodents)	
Family: <i>Sciuridae</i> (Squirrels)	
<i>Marmota monax monax</i> (Linnaeus)	Southern Woodchuck*
<i>Tamias striatus fisheri</i> (Howell)	Fisher's Chipmunk*
<i>Tamias striatus lysteri</i> (Richardson)	Northeastern Chipmunk (†)
<i>Tamiasciurus hudsonicus loquax</i> (Bangs)	Southern Red Squirrel*
<i>Sciurus carolinensis leucotis</i> (Gapper)	Northern Gray Squirrel*
<i>Sciurus niger rufiventer</i> (Geoffroy)	Western Fox Squirrel*
<i>Sciurus niger vicinus</i> (Bangs)	Allegheny Fox Squirrel (?)
<i>Glaucomys volans volans</i> (Linnaeus)	Eastern Flying Squirrel*
<i>Glaucomys sabrinus macrotis</i> (Mearns)	Northern Flying Squirrel (?)
Family: <i>Castoridae</i> (Beavers)	
<i>Castor canadensis canadensis</i> (Kuhl)	Canadian Beaver*
Family: <i>Cricetidae</i> (Native Rats and Mice)	
<i>Peromyscus maniculatus nubiterrae</i> (Rhoads)	Cloudland Deer Mouse*
<i>Peromyscus maniculatus bairdii</i> (Hoy & Kennicot)	Prairie Deer Mouse*
<i>Peromyscus leucopus noveboracensis</i> (Fischer)	Northern White-footed Mouse*
(<i>Oryzomys palustris palustris</i> (Harlan)	Eastern Rice Rat)
<i>Neotoma magister</i> (Baird)	Allegheny Wood Rat*
<i>Synaptomys cooperi stonei</i> (Rhoads)	Stone's Lemming Mouse*
<i>Clethrionomys gapperi gapperi</i> (Vigors)	Gapper's Red-backed Mouse*
<i>Microtus pennsylvanicus pennsylvanicus</i> (Ord)	Pennsylvania Meadow Mouse*
<i>Pitymys pinetorum scalopsoides</i> (Audubon & Bachman)	Northern Pine Mouse*
<i>Ondatra zibethica zibethica</i> (Linnaeus)	Common Muskrat*
Family: <i>Muridae</i> (Old World Rats and Mice)	
<i>Mus musculus musculus</i> (Linnaeus)	House Mouse*
<i>Rattus norvegicus</i> (Erxleben)	Norway Rat*
Family: <i>Zapodidae</i> (Jumping Mice)	
<i>Zapus hudsonius hudsonius</i> (Zimmerman)	Meadow Jumping Mouse*
<i>Napaeozapus insignis insignis</i> (Miller)	Woodland Jumping Mouse*
Family: <i>Erethizontidae</i> (American Porcupines)	
<i>Erethizon dorsatum dorsatum</i> (Linnaeus)	Canada Porcupine*
Order: <i>Lagomorpha</i> (Hares and Rabbits)	
Family: <i>Leporidae</i>	
<i>Lepus americanus virginianus</i> (Harlan)	Virginia Varying Hare*
<i>Sylvilagus floridanus mearnsii</i> (Allen)	Mearns Cottontail*
<i>Sylvilagus transitionalis</i> (Bangs)	New England Cottontail (?)

Order: *Artiodactyla* (Even-toed Hoofed Mammals)

Family: *Cervidae* (Deer)

(*Cervis canadensis canadensis* (Erxleben)American Elk)

Odocoileus virginianus borealis (Miller)Northern White-tailed Deer*

Family: *Bovidae* (Cattle, etc.)

(*Bison bison bison* (Linnaeus)American Bison)

SYSTEMATIC ACCOUNT OF THE SPECIES OF MAMMALS

In the following pages we are presenting brief discussions of the various species of mammals now known to occur, or to have occurred within comparatively recent times, in southwestern Pennsylvania. With a very few exceptions these data are based entirely on the field work of this survey, and of those persons who have been associated with it.

Ranges of each species in this part of the state are given as accurately as present information permits. Information on the habitat preferences and also about those factors which are apparently essential in the habitat occupied by various species are given as completely as possible.

Food habits and breeding habits have been discussed wherever pertinent information has been obtained during the course of this survey. Females were invariably examined for breeding data; and a record of the number and sizes of embryos, and the number of placental scars, were kept at all times. We are presenting our breeding data in the form of a concise summary, instead of in tabular form, believing that it will be much more easily interpreted by the majority of our readers. Data on weights and measurements are given for most species, these being based entirely on specimens collected during the survey. In all cases the measurements for males and females have been given separately. All measurements are given in millimeters, and in most cases both the average and extremes are shown. Weights are given in grams except in the case of a few of the larger mammals.

The nomenclature employed follows that used by William J. Hamilton, Jr., in his *Mammals of the Eastern United States*, except in a very few instances.

VIRGINIA OPOSSUM

Didelphis virginiana virginiana

DISTRIBUTION: Found in every county of the region but most abundant outside of the mountainous sections.

HABITAT: Usually forested or partially wooded areas. It is very abundant in agricultural sections where the woods are not continuous, but it is not uncommon in heavily forested areas. Wooded ravines, small stream valleys, and rock ledges are preferred haunts.

NOTES: The opossum apparently was not present in this region prior to its settlement by the white man. It is a southern species which has gradually extended its range northward into the present region with-

in the past century. No evidence of opossum remains were found at the sites of Indian villages in the southern parts of Fayette and Somerset counties (Gilmore, 1946). Rhoads (1903) quoted Mr. Henry D. Moore, one of his correspondents, as saying they were becoming numerous near New Lexington, Somerset County, about the turn of the century, but that ten or fifteen years previously none were present in that locality. Throughout this region there is a prevalent opinion that the opossum has steadily increased in numbers during recent years. Many persons can recall when they were considered to be somewhat of a rarity.

The stupid and slow-moving opossum is frequently killed on the highways throughout this region. The low prices paid for their pelts in recent years has offered little inducement to the trapper, but they constantly blunder into sets made for other fur-bearers. Fox trappers consider them to be a primary nuisance.

FOOD HABITS: The opossum is an exceedingly omnivorous feeder; almost anything that is in the least edible apparently occurs on its bill-of-fare. Its status as a predator of small game is much disputed. Some persons claim that it destroys many nestling rabbits; but we found nobody who had made a direct observation supporting that charge. Certainly no opossum would hesitate to devour the eggs or the helpless young in any bird's nest it blundered into; and it seems entirely reasonable that nests with very small cottontails might suffer a similar fate. It has at times been caught in poultry houses, placidly sleeping off a repast of hen's eggs.

Eighteen of the stomachs we received from trappers during the late fall and winter months contained recognizable food items. They are listed here according to the percentage of frequency of their occurrence. It was not possible in all cases to determine whether or not an item actually constituted carrion, for which the opossum has a well-known predilection. Items indicated by an asterisk (*) may represent either bait or carrion rather than animals actually killed by opossums.

Insects and spiders	83.3%	Shrews and moles	11.1%
Fruits	44.4%	Poultry (*)	11.1%
Cottontail rabbit (*)	27.7%	Woodchuck (*)	11.1%
Birds (other than poultry)	22.2%	Frogs and toads	5.1%
Mice ...	22.2%	Earthworms	5.1%
Carrion (determinable cases)	22.2%		

BREEDING: A female taken near Markleysburg, Fayette County, on June 24, 1948, had nine young ones in her pouch. These averaged about 30 mm (1-3/16 inches) in length.

SPECIMENS TAKEN: 16—Fayette 2, Greene 11, Somerset 1, Westmoreland 2.

HAIRY-TAILED MOLE
Parascalops breweri

DISTRIBUTION: Found throughout the region, but rare, or even absent, in the rockier situations in the mountains.

HABITAT: This mole is rather general in its distribution; but it is more common in those areas where deep friable soils occur, either in forest or field areas. It is frequently a pest in lawns, gardens, and golf courses. It is often very abundant on alluvial floodplains, but it usually shuns the wetter and mucky soils frequented by the star-nosed mole.

NOTES: *Parascalops* is the "common mole" throughout this part of Pennsylvania; no specimens of *Scalopus aquaticus* having thus far been taken west of the Allegheny Mountains. The subterranean galleries of this mammal, and the pushed-up piles of earth resulting from their excavation, are familiar to farmers, gardeners and greenkeepers.

Although this mole usually confines its activities to well-drained soils, a specimen was taken in Cambria County in water-saturated soil which was wetter and more mucky than some runs in which the star-nosed mole has been taken. It is unusual to find both moles in the same habitat, but in Somerset County they were taken in the same run on successive nights. The site was along the high water line of the Youghiogheny Reservoir, although at the time the water had receded and the ground was fairly dry. Other species of small mammals, particularly the short-tailed shrew, were often taken in mole runs.

BREEDING: Testes in a male specimen taken on February 20, 1948, were obviously enlarged.

SPECIMENS TAKEN: 21—Cambria 3, Fayette 4, Greene 3, Somerset 9, Westmoreland 2.

MEASUREMENTS: Average 12 males; total length 157.3 mm (143-163 mm), tail length 33.2 mm (29-35 mm), hind foot 19.3 mm (17-20 mm); weight 11 males, 51.6 grams (41.5-63.0 grams). Average 10 females; total length 156.6 mm (150-165 mm), tail length 33.5 mm (30-36 mm), hind foot 18.9 mm (18-21 mm); weight 6 females, 51.9 grams (45.0-63.0 grams).

STAR-NOSED MOLE

Condylura cristata cristata

DISTRIBUTION: Apparently confined to the Allegheny Mountains Section in our region. It is known to occur in Cambria, Indiana, Somerset, the eastern portion of Westmoreland and probably also the eastern portion of Fayette counties.

HABITAT: The mucky soils of swales, seepage areas, and wet bottomlands. In our region this habitat is often characterized by thickets of alder, silky dogwood and arrowwood; with an understory of such herbaceous species as skunk cabbage, green hellebore, marsh marigold, cattail, rushes and various sedges.

NOTES: In our region the star-nosed mole can hardly be considered to be a common species, and it seems to be decidedly local in its occurrence. Rhoads (1903) stated that it was found in every county, and he claimed to have received two specimens from Washington County. Although apparently suitable habitats occur in the western counties, we

have no knowledge of this mole's occurrence there south of the Ohio River.

At times the star-nosed mole seems to lead an aquatic existence. Often its runways are more or less full of water. In Cambria County they were taken under from 4 to 6 inches of water in the wettest part of a swale area. Occasionally they move for some distance over dry land. Possibly these are merely random movements, although they may actually be migrations in search of other suitable habitats. Two specimens—one in Somerset and another in Westmoreland County—were killed while attempting to cross highways. Another, in Somerset County, was found wandering on the surface of the ground in the yard of an old farm house where we had our headquarters. The hairy-tailed mole was common in the yard where this specimen was captured.

BREEDING: A female taken on July 23, 1948, contained 3 embryos averaging 8 mm in length.

SPECIMENS TAKEN: 10—Cambria 3, Somerset 6, Westmoreland 1.

SPECIMENS SEEN: Indiana 1 (Collection of Dwight E. Sollberger), Somerset 2 (Carnegie Museum).

MEASUREMENTS: Average 8 males; total length 176.0 mm (167-188 mm), tail length 67.8 mm (63-77 mm), hind foot 25.3 mm (23-27 mm); weight 4 males, 49.1 grams (44.0-59.0 grams). Average 2 females; total length 175.5 mm (169-182 mm), tail length 67.5 mm (62-73 mm), hind foot 25.5 mm (25-26 mm); weight 1 female, 46.5 grams.

MASKED SHREW

Sorex cinereus cinereus

DISTRIBUTION: Occurs in the mountain and plateau sections of Cambria, Somerset, Westmoreland, and possibly Fayette counties.

HABITAT: Most common in wooded habitats, although frequently also found in field areas. Most numerous in the cool, moist, and rocky mountain forests; occurring both in the deciduous and the mixed deciduous and coniferous types.

NOTES: There was a high population of this little shrew on Laurel Hill Mountain, to the east of Laughlintown and Rector, during the winter of 1947-1948, during which it was taken at virtually every locality which was trapped. During the winter of 1948-1949 it was absent, or very scarce, in many of the localities where it had been common the previous winter. However, although there was evidence of an overall decline in the population, there were a few localities where it still seemed to be rather numerous as late as the spring of 1949. One of these was a rocky area in the forest near the western base of Laurel Hill Mountain (altitude 1,400 ft.), and the other was in an abandoned field near the summit of the mountain (altitude 2,600 ft.). Concentrations of this mammal seem to be definitely localized. No specimens were taken on Laurel Hill Mountain farther to the south, in Fayette County, during the spring of 1948. Likewise it was exceedingly rare in the inter-moun-

tain plateau section of Cambria County in the summer of 1948. During the spring of 1949 several localities along Chestnut Ridge were trapped; but not a single specimen of this shrew was taken. At all of these localities there seemed to be an abundance of apparently suitable habitat. During the winter of 1948-1949 a few specimens were taken in the Ligonier Valley, between Laurel Hill Mountain and Chestnut Ridge, west as far as the Loyalhanna Creek.

BREEDING: A female taken on April 25, 1949, contained 6 embryos averaging 4 mm in length; one taken on May 21, 1949, contained 5 embryos averaging 12 mm in length; and one taken on May 22, 1949, showed 4 placental scars, indicating recent birth. An individual taken on July 9, 1948, was apparently nursing young. Several litters are probably produced between May and October. We found no embryos in any specimens taken during November.

SPECIMENS TAKEN: 155—Cambria 1, Somerset 26, Westmoreland 128.

MEASUREMENTS: Average 56 males; total length 94.7 mm (85-107 mm), tail length 40.0 mm (36-46 mm), hind foot 12.0 mm (11-14 mm); weight 3.3 grams (2.8-5.5 grams). Average 33 females; total length 93.3 mm (86-104 mm), tail length 39.4 mm (32-44 mm), hind foot 11.9 mm (11-13 mm); weight 3.0 grams (2.5-4.8 grams).

SMOKY SHREW

Sorex fumeus fumeus

DISTRIBUTION: Generally distributed throughout the region but apparently more common in the mountainous section.

HABITAT: Most common in wooded habitats but occasionally found in open fields or marshy areas. The optimum habitat seems to be woods with deep undisturbed soils, an abundance of leaf mold and leaf litter, and rotten stumps and logs. In the mountains it is frequently found in rocky areas.

NOTES: Although the smoky shrew has a much wider distribution than any of our other species of *Sorex*, it was nowhere found in such large numbers as the masked shrew. On November 23, 1948, Mr. Clyde W. Carns presented us with a male specimen which his dog had killed as the little beast emerged from beneath a rock. Upon lifting the rock, Mr. Carns states that he found a "neat little nest composed entirely of chewed up leaves".

BREEDING: Male specimens taken during the latter part of February appeared to be coming into the breeding condition. The following breeding data were obtained from female specimens: April 12, 1949—5 embryos averaging 9 mm in length; May 11, 1948—Lactating; May 12, 1949—Lactating; also contained 5 embryos averaging 3 mm in length; July 9, 1948—Lactating.

SPECIMENS TAKEN: 105—Beaver 4, Cambria 7, Fayette 13, Greene 4, Indiana 3, Somerset 18, Washington 1, Westmoreland 55.

MEASUREMENTS: Average 31 males; total length 115.6 mm (103-121 mm), tail length 45.0 mm (39-51 mm), hind foot 13.3 mm (11-14 mm); weight 6.8 grams (4.8-10.0 grams). Average 25 females; total length 110.3 mm (102-125 mm), tail length 44.9 mm (41-49 mm), hind foot 13.2 mm (12-15 mm); weight 6.4 grams (4.8-9.5 grams).

GRAY LONG-TAILED SHREW

Sorex dispar

DISTRIBUTION: As far as known limited to the mountainous portions of Westmoreland and Somerset counties. It may be expected to occur in the mountains of Fayette and Cambria counties as well.

HABITAT: Cool, moist, and very rocky situations in either deciduous or mixed deciduous and coniferous woodlands.

NOTES: The gray long-tailed shrew is apparently the rarest and most localized in distribution of any species of *Sorex*. Its usual habitat seems to be those decidedly rocky areas found throughout our mountain region, where residual sandstone boulders are piled one on top of another, and subterranean labyrinths of cool and dark passageways ramify them to an unknown depth. In such situations there is usually no soil, merely an accumulation of humus and leaf litter between the rocks; but mosses and ferns often grow there in profusion. The predominant trees in such areas are those which love to cling to rocks, straddling them with their bare roots. Among such trees are the yellow and black birches, the striped and the red maples, and occasionally a rock oak or a hemlock. Several times, on Laurel Hill Mountain, we have taken the masked and smoky shrews in the same locality with the gray long-tailed shrew. Other species commonly associated with it are the cloudland deer mouse, red-backed mouse, and the short-tailed shrew.

Strangely enough, at no time did we obtain specimens of this shrew from apparently suitable habitats at high elevations on the mountain ridges. All of the localities at which it has been taken were well down the slopes of the mountains, and, in several instances, at or very near the foot of the ridges.

SPECIMENS TAKEN: 11—Somerset County—1. Eastern slope of Laurel Hill Mountain near Kooser State Park, 8 miles northwest of Somerset. Westmoreland County—10. Specimens were taken at the following localities:

Lynn Run Valley on western slope of Laurel Hill Mountain, 2 miles south-southeast of Rector. Elevation 1,600 ft.

Lynn Run Valley at Boot Hollow Spring, 4 miles south-southeast of Rector. Elevation 2,300 ft.

Foot of Laurel Hill Mountain, 1/2 mile south-southeast of Laughlintown. Elevation 1,400 ft.

Loyalhanna Gap (St. Clair Hollow) in Chestnut Ridge, 4 miles southeast of Latrobe. Elevation 1,060 ft.

MEASUREMENTS: Average 8 males; total length 119.0 mm (111-125 mm), tail length 57.1 mm (54-61 mm), hind foot 14.8 mm (14-15 mm); weight 5.6 grams (3.9-6.3 grams). Average 3 females; total length 116.7 mm (113-122 mm), tail length, 56.3 mm (54-60 mm), hind foot 15 mm; weight 4.3 grams (4.4-5 grams).

WATER SHREW

Sorex palustris (Subsp.?)

DISTRIBUTION: Unknown. The only specimen that has been secured thus far in southwestern Pennsylvania was taken by us in the Negro Mountains of southern Somerset County.

HABITAT: Our specimen came from a typical rocky-bedded mountain stream bordered by a hemlock-birch-rhododendron association, at an elevation of 2,560 feet above sea level.

NOTES: On June 8, 1949, we took a male water shrew on Cove Run, about a quarter of a mile west of the Big Spring. This little stream rises near the base of Mt. Davis and flows in a westerly direction between Cove and Glade Mountains, emptying into the Castleman River south of Fort Hill. About a quarter of a mile west of the Big Spring the stream falls approximately fifteen feet in twenty-five yards. Numerous pools are found immediately below the falls and gorge. Ferns and mosses grow in profusion along the moist, shaded banks, while a luxuriant growth of the water moss (*Fontinalis*) covers many of the stones in the stream itself. Our specimen was taken in a mouse trap baited with bacon rind, and set between two moss-covered rocks in the center of one of these pools.

MEASUREMENTS: One male; total length 134 mm, tail length 64 mm, hind foot 19 mm; weight 11.1 grams.

SMALL SHORT-TAILED SHREW

Cryptotis parva parva

DISTRIBUTION: Unknown. Specimens were taken only near Indiana, Indiana County; and remains of this shrew were found in owl pellets from the vicinity of Kuhntown, Greene County. Clay L. Gifford has also taken it in the vicinity of Waynesburg, Greene County.

NOTES: The Indiana County habitat was a narrow strip of unmowed meadow between a fenced-off pastured area and a cornfield. The cover in the unmowed strip was composed of bluegrass, orchard grass and a mixture of weedy herbs. One or two of the animals were actually taken within the adjoining cornfield which had a moderately dense groundcover composed of yellow foxtail, smartweeds and lesser ragweed. A total of five specimens was taken here, all within a radius of not more than 50 feet.

NOTES: During the winter of 1947-1948, owl pellets were collected in a planting of coniferous trees about 1 mile east of Kuhntown, Greene County. The contents probably represented the animals eaten by two species of owls—the barn owl and the long-eared owl. Both had been observed using this roost. Out of a total of 306 mammals, the remains of which were found in the pellets, there were the skulls of 9 *Cryptotis*. Apparently this little shrew is not common in this region, but it probably has a much wider distribution than our present records indicate.

SPECIMENS TAKEN: 5—Indiana 5. Specimens found in owl pellets: 9—Greene 9.

MEASUREMENTS: Average 4 males; total length 72.2 mm (70-74 mm), tail length 14.8 mm (13-16 mm), hind foot 9.8 mm (9-10 mm); weight 4.0 grams (3.7-4.5 grams). One female; total length 72 mm, tail length 15 mm, hind foot 10 mm; weight 4.5 grams.

SHORT-TAILED SHREW

Blarina brevicauda brevicauda

DISTRIBUTION: Occurs throughout the region. It is our most uniformly distributed mammal.

HABITAT: Found in practically every conceivable type of terrestrial habitat and about equally as abundant in forested as in non-forested areas. Often very common in cultivated fields.

NOTES: The ubiquitous *Blarina* is one of the most widely distributed and abundant of all our mammals. In this region it occurs at all altitudes, in both wet and dry situations, in the forests and in the fields. Where there are deep soils, it either constructs its own subterranean runways or appropriates those made by moles and mice; but it is just as common among the rocks which cover the ground on our mountain ridges. No other species of mammal exhibits less restriction by habitat factors than does the short-tailed shrew. It is active at all hours of the day or night, and at all times of the year; yet it is one of those creatures which are comparatively unfamiliar to the average person, and often called a "mouse" or a "mole".

The shrew performs a distinct service to the farmer, for it feeds extensively on insects and their larvae. It is a thoroughly vicious little beast, fully capable of killing mice very much larger than itself. Frequently, these shrews destroyed our trapped specimens of the smaller rodents—and even other *Blarina*—devouring everything but the mangled skins. Traps placed in runways have often yielded one of these mammals each night during several successive nights.

BREEDING: Most male specimens show indications of coming into the breeding condition between the middle of February and the first of March. The first litters are apparently born during the latter part of

March or early in the month of April. Juvenile animals begin to be common in the latter part of April or in early May. There are several litters during the course of the summer. From 5 to 8 embryos have been found in these animals, 5 being the more common number. A female containing 5 embryos, averaging 8 mm in length, was taken on March 5, 1949. By the early part of April pregnancy becomes much more common.

SPECIMENS TAKEN: 1,570—Beaver 55, Cambria 192, Fayette 250, Greene 174, Indiana 125, Somerset 390, Washington 24, Westmoreland 360.

MEASUREMENTS: Average 169 males; total length 117.8 mm (104-131 mm), tail length 26.3 mm (21-31 mm), hind foot 15.0 mm (12-17 mm); weight 18.2 grams (12-24.5 grams). Average 124 females; total length 112.7 mm (100-128 mm), tail length 25.5 mm (21-31 mm); hind foot 14.8 mm (13-17 mm); weight 15.7 grams (11.5-24.5 grams).

LITTLE BROWN BAT

Myotis lucifugus lucifugus

DISTRIBUTION: Occurs throughout the region.

HABITAT: In flight, feeds everywhere. During the day it retires to dark places such as buildings, caves, or crevices in rocks. In the winter they congregate in caves to hibernate.

NOTES: This is one of the most common bats in southwestern Pennsylvania. They usually emerge from their daytime hiding places about dusk; but on April 15, 1948, we collected a female about noon on a bright, sunny day. Mr. John E. Guilday collected nine specimens in Coon Cave on Chestnut Ridge, Westmoreland County, on January 2, 1948. Approximately 200 were counted in this cave. He also obtained specimens in Delancy Cave, Fayette County, during the spring of 1947. Guilday (1948) has described this bat as actively copulating in Coon Cave on January 3, 1948.

MEASUREMENTS: Average 4 females; total length 85.3 mm, tail length 34.5 mm, hind foot 9.3 mm, ear 14 mm, tragus 6.8 mm; weight 7.8 grams.

LEAST BROWN BAT

Myotis subulatus leibii

DISTRIBUTION: Probably throughout the region, but possibly rare and local.

HABITAT: Similar to that of the little brown bat.

NOTES: Mr. Guilday took a single specimen in Delancy Cave, Fayette County, on February 7, 1948. It has also been reported from Allegheny and from Greene County.

SAY'S BAT

Myotis keenii septentrionalis

DISTRIBUTION: Probably throughout the region, but possibly more or less local.

HABITAT: Apparently similar to that of the little brown bat.

NOTES: On July 15, 1948, we located a breeding colony at "Lonely Acres", about 5 miles north-northeast of Ebensburg, Cambria County. We collected ten adults, all of which were females; and one juvenile male which was apparently just learning to fly. This colony was located in a building which was situated in a clearing, and close to a small artificial lake. Mr. Woodrow W. Goodpaster found a lone male in a dark crevice among some rocks near Bakersville, Somerset County, on September 29, 1947. Mr. Guilday obtained two specimens of this bat in Delaney Cave, Fayette County, on February 7, 1948. It has also been reported from Allegheny and Greene counties.

MEASUREMENTS: Average 10 females; total length 84.6 mm (82-88 mm), tail length 37.8 mm (36-39 mm), hind foot 9.9 mm, ear 18.2 mm (17-19 mm), tragus 10.8 mm (10-12 mm); weight 6.2 grams. Measurements of one male were: total length 90 mm, tail length 39 mm, hind foot 9 mm, ear 20 mm, tragus 12 mm; weight 7.5 grams.

INDIANA BAT

Myotis sodalis

NOTES: The only record we have for this species is in Fayette County. Mr. Guilday obtained two specimens in Delaney Cave on February 7, 1948, and another on February 28.

SILVER-HAIRED BAT

Lasionycteris noctivagans

DISTRIBUTION: Probably throughout the region, at least during the spring and fall migrations.

HABITAT: Wooded or semi-wooded areas. Retires to the foliage of trees during the day. In feeding it often flies over fields, or even occasionally in towns.

NOTES: Two specimens were taken near Bakersville, Somerset County; a female on October 4, 1947; and a male on October 6. Although these dates indicate that the specimens were possibly migrants, this bat may breed in the forests of the Allegheny Mountains Section. It has also been reported from Westmoreland and Greene counties.

MEASUREMENTS: One male; total length 93 mm, tail length 40 mm, hind foot 9 mm, ear 19 mm, tragus 10 mm; weight 9 grams. One female; total length 95 mm, tail length 46 mm, hind foot 8 mm, ear 17 mm, tragus 9 mm.

GEORGIA PIGMY BAT

Pipistrellus subflavus subflavus

DISTRIBUTION: Probably throughout the region.

HABITAT: Similar to that of the little brown bat.

NOTES: Mr. John E. Guilday took specimens of this bat at Delaney Cave, Fayette County, during the spring of 1947 and again on February 28, 1948; at Barton's Cave in the same county on April 18, 1948; and at the Strangford Cave, Indiana County, on January 2, 1948.

BIG BROWN BAT

Eptesicus fuscus fuscus

DISTRIBUTION: Occurs throughout the region.

HABITAT: In feeding it flies everywhere; retiring by day to buildings, caves, or crevices among rocks. Hibernates in caves, and possibly buildings, during the winter months.

NOTES: The big brown bat is perhaps the most common bat found in southwestern Pennsylvania. It frequently roosts in barns or attics, often in large colonies. In the late summer and early fall, prior to their winter's hibernation, these bats become excessively fat. Specimens taken during August and September were so fat that their fur was almost immediately covered by the oil that literally oozed out of shot wounds.

The big brown bat has been recorded from every county in this region. Mr. Guilday took specimens at the Strangford Cave, Indiana County, on January 18, 1948; at Barton's and Delaney Caves, Fayette County, on February 28, 1948; and at Bear Rock Cave, near Sewickley, Allegheny County, on January 2, 1948. We found it to be quite abundant near Somerset, Somerset County, in August and September 1947.

MEASUREMENTS: Average 10 males; total length 111.7 mm (100-117 mm), tail length 46.3 mm (39-50 mm), hind foot 10.7 mm (10-12 mm), ear 16.9 mm (15-18 mm), tragus 8.2 (6-9 mm); average weight of 2 males 18.2 grams. Average 6 females; total length 110.3 mm (105-114 mm), tail length 46.8 mm (41-52 mm), hind foot 10.8 mm (10-12 mm), ear 17.5 mm (17-18 mm), tragus 8.0 mm (7-9 mm).

RED BAT

Lasiurus borealis

DISTRIBUTION: Occurs in all parts of the region, at least during the spring and fall migrations.

HABITAT: Wooded or semi-wooded areas, occasional about towns in shade trees. In feeding it probably flies everywhere, but it seems to feed more often over wooded areas. Retires to foliage of trees during day.

NOTES: The red bat is migratory, and it moves south from our region with the approach of winter. It seems to be a fairly common species in the extensively wooded sections. We observed that this bat

was one of the first bats to become active after sundown. During the early part of the evening they often cruised just above the tree tops, but later they took to higher altitudes. We took specimens of this bat in Somerset and Cambria counties, and observed it along Laurel Hill Mountain in Westmoreland County. Mr. Clay L. Gifford has taken specimens in the vicinity of Waynesburg, Greene County, in recent years. There are several specimens from Allegheny County in the collection of the Carnegie Museum.

MEASUREMENTS: Average 10 males; total length 104.8 mm (99-112 mm), tail length 49.4 mm (45-54 mm), hind foot 8.2 mm (7-10 mm), ear 12.1 mm (10-14 mm), tragus 7.1 (6-8 mm); weight of 5 males 10.7 grams (9.5-12.0 grams).

HOARY BAT

Lasiurus cinereus

NOTES: Mr. Clay L. Gifford has taken this species in the vicinity of Waynesburg, Greene County. We have no other records for it in the present region. It is apparently rare, but it should occur in the more extensively forested sections.

TWILIGHT BAT

Nycticeius humeralis

NOTES: Mr. Clay L. Gifford states that a breeding colony of these bats was formerly present in one of the buildings at Waynesburg College, Waynesburg, Greene County. We know of no other records for this southern species in the present region.

BLACK BEAR

Ursus americanus americanus

DISTRIBUTION: Uncommon, principally occurring as occasional transients in the Allegheny Mountains Section. There have been records in recent years from Cambria, Fayette, Greene, Indiana, Somerset and Westmoreland counties.

HABITAT: Usually heavily forested areas, but occasionally bears venture into the agricultural sections.

NOTES: The black bear is now of rather infrequent occurrence in this region, although it was common at the time the region was settled. These animals seem to be somewhat more common in Cambria County than elsewhere in the region. No fewer than five individuals have been taken in that county during legal bear seasons since 1940. Occasional reports of bears, and of bear damage to sheep and calves, have been received from several counties during the past two decades.

Game Protector Robert D. Reed observed a bear which had been hit by a train near Packsaddle, Westmoreland County, on March 28, 1942. Game Protector John F. Blair reported that one appeared in Center Township, Greene County, during the month of December 1942; and there have been reports that bears have been seen in the latter county within the past year.

During the early part of December 1947, several deer hunters reported that they had seen bears or their tracks in the snow along Laurel Hill Mountain east of Laughlintown and Rector.

Game Protector William G. Matthews finally came across the track of a large individual, and followed it into the state game refuge in the Lynn Run Valley. There were no subsequent reports of bears in that vicinity. Neither bears nor their tracks were reported during the winter of 1948-1949, and we presume that this was merely a transient.

EASTERN RACCOON

Procyon lotor lotor

DISTRIBUTION: Found throughout the region; common to locally abundant in most of the counties.

HABITAT: Wooded and semi-wooded areas. Optimum habitat appears to be stream valleys, but in feeding it often ranges along the ridges and frequents farm lands. Suitable den sites such as large hollow trees, or crevices among rocks, are a prerequisite in habitability of an area.

NOTES: The raccoon has apparently increased in numbers within the last decade. In recent years the low price paid for their pelts has tended to discourage the trapping of them as a fur-bearer, but in most sections "coon" hunting with dogs is a popular sport. Fur dealers report that young raccoons do not become prime before the latter part of November or early December, but most of the older animals become prime about the middle of November.

FOOD HABITS: Analyses were made of 41 stomachs of late fall and winter killed animals which contained recognizable food items. The most important foods, at this season, arranged according to their percentage of frequency, are as follows:

Corn	43.9%	Mast (acorns and hickory nuts)	12.1%
Insects and spiders	43.9%	Birds	7.3%
Crayfish	29.2%	Mice	4.8%
Fruits	24.3%		

Mammals seem to constitute a relatively minor role in their diet; but the following forms were present: cottontail rabbit, squirrels, mice and shrews.

Two specimens taken in Fayette County during the early part of June 1948 had literally gorged themselves on the nymphs and adults of the seventeen-year cicadas which were then emerging. Later in the month they fed principally upon the fruits of the Juneberry (*Amelanchier*). In the late summer and fall months the fruits of the wild black cherry, pokeberry and wild grapes are prominent in their diet. Acorns, hickory nuts, and corn are staple items during the winter months.

SPECIMENS TAKEN: 9—Fayette 5, Greene 1, Somerset 2, Westmoreland 1.

MEASUREMENTS: Average 2 males; total length 727 mm, tail length 227.5 mm, hind foot 107 mm; weight 12 lbs., 12 ozs. Average 3 females; total length 716.7 mm, tail length 223 mm, hind foot 102 mm; weight 11 lbs., 10 ozs.

ALLEGHENY LEAST WEASEL

Mustela rixosa allegheniensis

DISTRIBUTION: Occurs in all of the counties of the region.

HABITAT: Probably forest edge and open areas, either in grass or in brush.

The specimen taken by us in Somerset County was evidently following the field mouse runs through tall grasses and scattered brush along a fencerow separating two field areas.

NOTES: This little weasel was first described by S. N. Rhoads, in 1900, from specimens obtained near Beallsville, Washington County. Sutton (1929) discussed the distribution of the species in Pennsylvania, basing his localities on least weasels presented for bounty. Since February 1948, a record of the least weasels presented for bounty has been kept by Mr. Harold L. Plasterer and his assistants in the Bounty Claims Section of the Game Commission at Harrisburg. During this time pelts of least weasels were received from all of the counties of southwestern Pennsylvania; but slightly over 80% of them came from the counties of Westmoreland, Indiana, Cambria, and Somerset. Least weasels comprised only a little over one percent of the weasels received from the southwestern counties, however. A record, by counties, of the total number of weasels bountied and the number of least weasels bountied between February 1948 and April 1949 is given below:

County	Total number of weasels	Number of least weasels
Allegheny	223	3
Beaver	54	1
Cambria	941	11
Fayette	466	1
Greene	103	2
Indiana	748	11
Somerset	1,155	9
Washington	119	3
Westmoreland	899	16
TOTAL	4,708	57

FOOD HABITS: No information derived from stomach analyses is available for this species. However, this diminutive carnivore apparently feeds principally on mice and probably small birds. It seems to share the bloodthirsty habits and the ferocity of the other species of weasels.

BREEDING: Mr. Charles M. Johnston, of Rector, presented us with two mounted specimens which were killed on July 25, 1945, about a mile south of Ligonier, Westmoreland County. One of these was a female which, according to Mr. Johnston, contained six small young ones at the time it was killed.

SPECIMENS TAKEN: 1—Somerset 1.

MEASUREMENTS: One male; total length 198 mm, tail length 33 mm, hind foot 22 mm.

NEW YORK WEASEL

Mustela frenata noveboracensis

DISTRIBUTION: Occurs in all of the counties of the region but more abundant in the Allegheny Mountains Section.

HABITAT: Most numerous in wooded and semi-wooded areas although it is often found in more open situations such as brushy field or stream borders, and stone or slab piles in fields and clearings. More rarely it even resides in urban and industrial communities.

NOTES: The New York, or long-tailed weasel, is the common species of weasel throughout this region. Fig. 7 shows the average annual number of weasels presented for bounty during the eleven-year period from June 1937 to May 1948. Inasmuch as practically all of these were New York weasels, this map gives us a good picture of the relative abundance of this species in the various counties of southwestern Pennsylvania. Somerset County has led all of the counties of this region in the average number presented for bounty; followed, in turn, by Westmoreland, Indiana, Cambria and Fayette. From this we may safely assume that the New York weasel is much more abundant in the Allegheny Mountains Section than it is farther west in the Pittsburgh Section of the Appalachian Plateau Province. In Greene County the trappers and fur dealers all agreed that weasels had been scarce during the past decade, a fact which is borne out by the average annual number of weasels presented for bounty from that county.

The majority of the weasels in this region, even in the mountainous sections, retain their brown coloration throughout the year. White weasels, however, have been taken occasionally in all parts of the region; but they amount to less than five percent of the total number. The average price paid for weasel pelts advanced from 24 cents in 1940 to \$1.78 in 1946.

FOOD HABITS: The weasel is strictly a carnivore, well-known for its blood-thirsty habits and for its sheer love of killing. Food habit studies based on analyses of their digestive tracts are often made difficult due to the fact that a high percentage of the digestive tracts of trapped animals are usually empty. Out of a total of twenty-two digestive tracts, analyses were made of nine which contained food items. They were obtained from trappers, principally in Somerset and Fayette counties, during the late fall and winter months. The food items found are given here according to their percentage of frequency.

Mice	55.5%	Birds	22.0%
Cottontail rabbit	33.5%	Shrews and moles	11.0%

SPECIMENS TAKEN: 20—Allegheny 2, Fayette and Somerset 16, Greene 1, Westmoreland 1.

MEASUREMENTS: Average 13 males; total length 376.3 mm (345-410 mm), tail length 128.5 mm (110-143 mm), hind foot 44.6 mm (42-49 mm); weight 4 males 220.1 grams (164.0-312 grams). Average 6 females; total length 304.8 mm (285-316 mm), tail length 95.3 (90-105 mm), hind foot 34.0 mm (32-35 mm); weight of one female 98.0 grams.

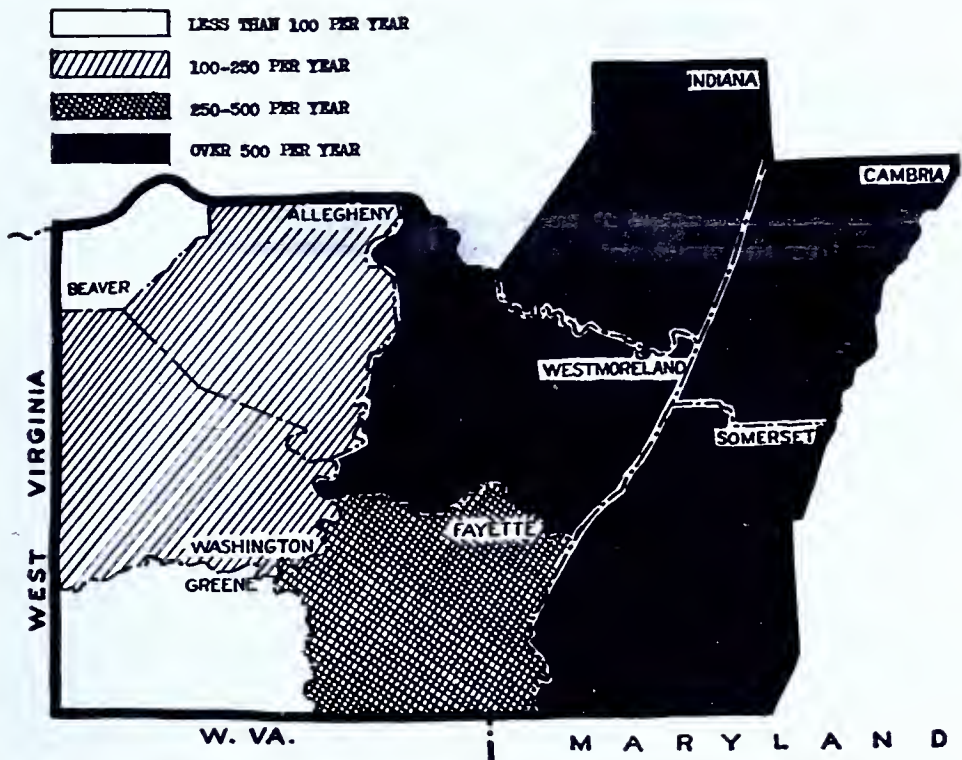


FIG. 7. AVERAGE ANNUAL NUMBER OF WEASELS PRESENTED FOR BOUNTY, JUNE 1937 — MAY 1948

NORTHEASTERN MINK

Mustela vison vison

DISTRIBUTION: Probably throughout the higher portion of the Allegheny Mountains Section, at least in former years.

HABITAT: Forested streams of the higher mountains.

NOTES: Rhoads (1903) stated that this form of the mink occurred along the higher mountains of Pennsylvania. It is known to occur at high elevations in the mountains as far south as Pocahontas County in West Virginia (Hamilton, 1943).

Mr. J. F. Roberts, who has bought furs at Confluence for a great many years, states that occasionally he has seen a small and very dark colored mink among the animals he has purchased during previous years. He believes that they came from the higher mountainous sections of Somerset County, probably from the Negro Mountain. He says that they are quite different from the animals commonly taken in the region, with a silky and more lustrous fur of much better quality than that of the common mink. We believe that the animals referred to by Mr. Roberts were of this race, although we were unable to obtain any specimens for critical examination.

SOUTHEASTERN MINK

Mustela vison mink

DISTRIBUTION: Occurs in all of the counties of this region. Less common in the mountain sections than elsewhere.

HABITAT: The mink is more numerous in the stream valleys, but it often wanders far from the water and occasionally roams the hill-tops and mountain ridges.

NOTES: During the past few years there has been a very high population of minks in Greene County. Elsewhere in our region it seems to be only fairly common, and in some localities it is seemingly quite scarce. Practically all of the fur dealers and trappers agree that the mink is the first of our fur-bearers to become prime in the fall. Pelts of the best quality are usually taken during the month of November.

FOOD HABITS: A total of 99 stomachs containing recognizable food items were analyzed. All of these animals were taken by trappers in Greene, Fayette and Somerset counties during the open seasons of 1947 and 1948. A large proportion of the mink stomachs and entire digestive tracts which were received were either empty or contained only dirt, apparently ingested by the animals in their attempt to free themselves from traps. The more important late fall foods, listed according to the percentage of frequency of their occurrence, were as follows:

Mice	34.3%	Birds	4.0%
Insects and spiders	28.2%	Salamanders	4.0%
Fish	22.2%	Norway rat	3.0%
Crayfish	21.2%	Muskrat	1.1%
Cottontail rabbit	7.0%		

Several fur dealers and mink trappers were interviewed in Greene County, and practically all of them agreed that the mink will kill rabbits. A few of them considered the mink to be a more serious rabbit predator than either species of fox. Some of the trappers stated that they had often followed mink tracks in the snow, and they had seen where the mink had killed rabbits. These animals range widely and hunt methodically, investigating every hole and cranny in their quest for prey. Although the mink is quite generally regarded as one of the muskrat's worst enemies, trappers and fur dealers were not inclined to blame the current scarcity of muskrats in Greene County on mink predation.

SPECIMENS TAKEN: 124 (including 122 skeletal specimens obtained from fur trappers) —Greene 106, Somerset and Fayette 18.

MEASUREMENTS: Average 51 males; total length 565.8 mm (488-631 mm), tail length 196.7 mm (168-225 mm), hind foot 62.5 mm (55-70 mm), Average 43 females; total length 490.3 mm (460-525 mm), tail length 167.4 mm (150-182 mm), hind foot 52.5 mm (47-58 mm).

NORTHEASTERN OTTER

Lutra canadensis canadensis

DISTRIBUTION: Formerly common along the rivers and creeks in all parts of the region. Now extinct or of extremely rare occurrence.

HABITAT: Creeks and rivers.

NOTES: We have no recent authentic records for the otter in this region. During the fall of 1947, there were reports that one was present along Dunkard Creek, just across the state line in West Virginia. Its tracks were said to have been seen by several trappers. Dunkard Creek flows across the state line for only a few miles. It heads in the southwestern part of Greene County and reenters the county again just southwest of Mt. Morris. There are two specimens from Allegheny County in the collection of the Carnegie Museum, Pittsburgh. One of these was collected by S. N. Rhoads near Pittsburgh, probably about 1898. The second specimen was collected near Homestead, on the Monongahela River, by J. A. Doyle, on March 25, 1899.

Mr. George W. Gordon, of Scottdale, Westmoreland County, showed us a mounted specimen which was taken in the vicinity of that town in 1905. This specimen is in the collection of the Westmoreland-Fayette Historical Society.

EASTERN SKUNK

Mephitis mephitis nigra

DISTRIBUTION: Occurs throughout the region; generally more or less common but often locally abundant.

HABITAT: Skunks are somewhat more numerous in the farming sections than they are in the more extensively wooded areas in the mountains. It prefers an interspersed of woods, meadow or pasture, and brushland.

NOTES: In our region the skunk population never seems to have suffered from the epidemic of disease which decimated them in the northwestern section of the state. Most observers in this region agree that the animal has maintained its numbers or actually increased within the past ten or fifteen years. Persons interviewed in Greene County stated that they could not remember a year when the skunk was not plentiful there.

Several observers told of having found a number of skunks—ranging up to 13 individuals—occupying the same den during the winter season. As a rule, most of the animals found in a den were females. Usually not more than one male was denned up with them. During the winter season males are more active and range farther than do the females, particularly during the breeding season which occurs in February.

Occasional animals with a brownish pelage have been found in Greene County. This peculiar color phase does not seem to occur elsewhere in the region.

FOOD HABITS: Analyses were made of the digestive tracts of 76 late fall trapped individuals containing recognizable food items. The commonest foods during the season, listed according to their percentage of frequency of occurrence, are as follows:

Insects and spiders	86.8%	Poultry	10.5%
Fruits	27.8%	Mice	5.2%
Carriion	13.1%	Corn	5.2%
Rabbit	10.5%	Birds (other than poultry)	3.9%

Wild fruits of many kinds are eaten when available. During the summer months skunks devour quantities of insects. It late May and June, 1948, the brood of the seventeen-year cicada was emerging in the southern part of Fayette County, and skunks fed extensively on both the nymphs and adults. Specimens taken in Somerset County during the month of August had been feeding almost exclusively on grasshoppers, crickets and grubs.

There was no uniformity of opinion among persons interviewed as to the skunk's role as a predator. Several observers stated that they will kill rabbits; others minimized their destructiveness to small game. It is known, however, that it has a predilection for eggs; and it undoubtedly destroys many nests of ground-nesting birds.

SPECIMENS TAKEN: 32—Greenc 23, Somerset 6, Westmoreland 3.

MEASUREMENTS: Average 7 males; total length 582.1 mm (539-625 mm), tail length 207.9 mm (184-226 mm), hind foot 65.7 mm (64-70 mm); average weight 2 males 5 lbs. 2½ ozs. Average 2 females; total length 577 mm, tail length 230 mm, hind foot 62 mm.

EASTERN GRAY FOX

Urocyon cinereoargenteus cinereoargenteus

DISTRIBUTION: Occurs in every county.

HABITAT: Wooded and semi-wooded areas. It shows a greater preference for forested and brushy regions than does the red fox although both species commonly occur together.

NOTES: The gray fox is apparently the only species of fox native to the present region. In pre-settlement days it was probably confined to the southernmost counties, but it has gradually spread northward until it has covered the entire region. Rhoads (1903) stated that it was apparently not present in Washington County about the turn of the century. Three or four decades ago it seems to have been rare, if not entirely absent, from the agricultural regions in the western tier of counties; being confined almost entirely to the more rugged and wooded terrain of the mountainous sections. In more recent years it has spread to all parts of the region, invading territory formerly occupied only by the red fox. There has been a gradual and steady increase in the gray fox population, in spite of the fact that a bounty has been paid on them almost continuously since 1915. An all-time high in the population occurred between 1944 and 1948, with some indications of a recession during the past year. The average annual number of gray foxes from our study area presented for bounty from June 1945 to May 1948 is shown in Fig. 8.

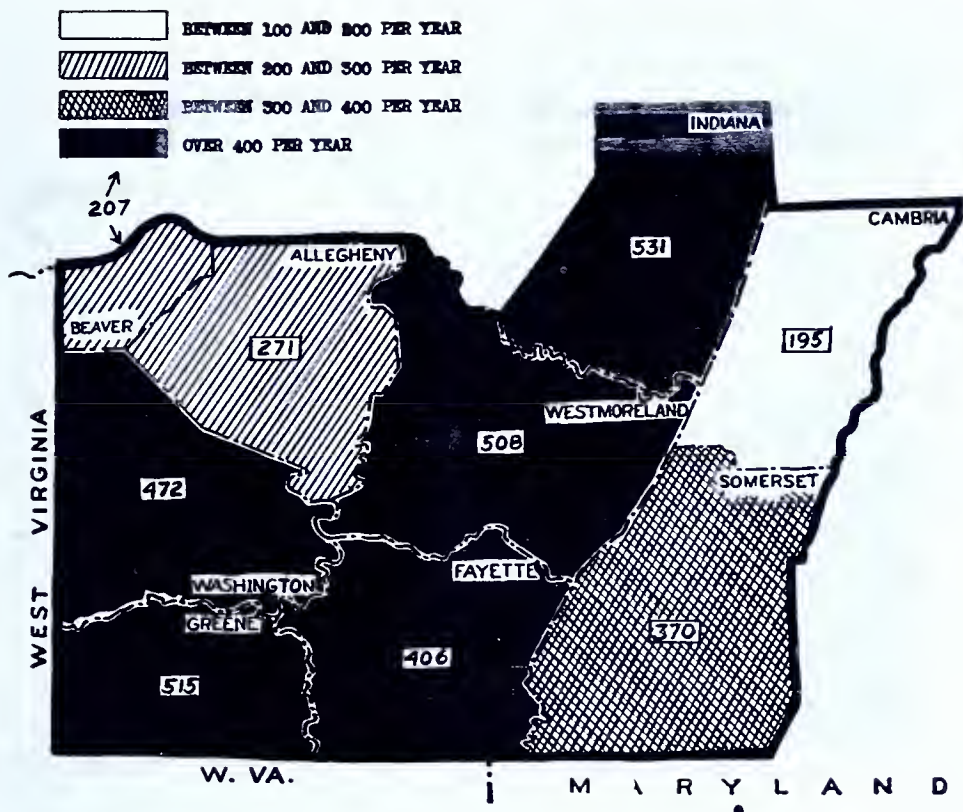


FIG. 8. AVERAGE ANNUAL NUMBER OF GRAY FOXES PRESENTED FOR BOUNTY, JUNE 1945 — MAY 1948

FOOD HABITS: Analyses were made of the stomachs of 73 fall-trapped gray foxes which contained recognizable food items. According to percentage of frequency of occurrence the most important food items were as follows:

Fruits (wild cherry, grape, etc.)	67.1%	Woodchuck	8.2%
Insects and spiders	54.7%	Birds (other than poultry)	5.4%
Mice	21.9%	Corn	5.4%
Cottontail rabbit	17.8%	Squirrels	2.7%
Shrews and moles	9.5%	Poultry	2.7%

SPECIMENS TAKEN: 5—Fayette 1, Greene 4.

EASTERN RED FOX

Vulpes fulva

DISTRIBUTION: Occurs in every county. Most abundant in the western tier counties; less frequent in the mountainous sections.

HABITAT: Wooded and semi-wooded areas. Seems to prefer the agricultural sections where there is an interspersation of woods, brush land, and open fields. Abandoned farm land apparently provides an optimum habitat before it reaches the dense brush stage.

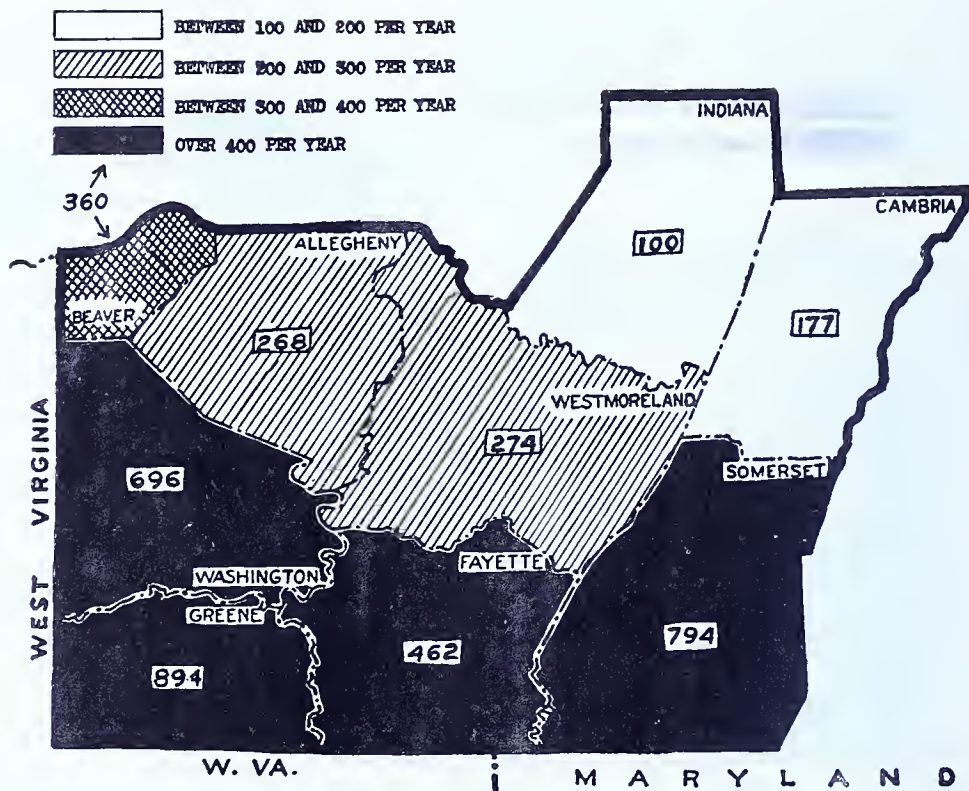


FIG. 9. AVERAGE ANNUAL NUMBER OF RED FOXES PRESENTED FOR BOUNTY, JUNE 1945 — MAY 1948

NOTES: There is very good evidence that the red fox was not present in the region prior to the days of settlement. The remains of this animal are significantly absent from pre-Columbian sites of Indian villages in the southern part of Fayette and Somerset counties, although remains of the gray fox were present (Gilmore, 1946). This fact lends credence to the belief that our present day red foxes are descended from the European red fox which was introduced into this country in colonial days for hunting purposes (see Gilmore, 1946; Rhoads, 1903).

During the past decade the population of red foxes showed a tremendous increase in all parts of the region, reaching an all-time high between 1944 and 1948. It was placed on the bounty list in 1945. Fig. 9 shows the average number of red foxes bountied annually between June 1945 and May 1948. While there has been a slight decline in the fox population within the past year, the red fox is still quite abundant in the western tier counties. Although large numbers of foxes have been taken by hunters and trappers in recent years, it is sometimes doubted that the decline in the population was solely attributable to man's efforts to reduce it; yet we have found no evidence that any disease or parasite was an important factor in helping to effect this reduction. There is a probability that the food supply may have been a factor, however, particularly during the winter months. Cottontail rabbits and field mice, both of which are important items in the winter diet of foxes, reached

a very low population level immediately preceding the decline in the fox population.

FOOD HABITS: A study was made of the late fall food habits of the red fox. A total of 103 stomachs contained recognizable food items. The principal foods at this season are presented herewith, arranged according to the percentage of frequency of their occurrence.

Fruits (wild cherries, grapes, etc.)	70.8%	Cottontail rabbits	15.6%
Insects and spiders	58.2%	Birds (other than poultry)	11.6%
Mice	28.1%	Miscellaneous mammals	11.6%
Shrews and moles	20.3%	Poultry	3.8%

Several observers in Greene County state that they have seen the remains of young lambs about red fox dens in the spring of the year. It is claimed that most of these lambs were killed by foxes.

BREEDING: Mr. J. F. Roberts, Confluence, states that in mid-March (1947), he skinned a female which contained six pups almost large enough to be born.

SPECIMENS TAKEN: 4—Fayette 1, Greene 2, Westmoreland 1.

COYOTE

Canis latrans latrans

DISTRIBUTION: Sporadic and rare.

NOTES: Occasional individuals of this species have been taken in the counties of southwestern Pennsylvania during the past few decades. It is possible that many of the animals taken in a feral state have merely been escaped captives. Occurrences of coyotes have been responsible for some of the "records" of wolves in recent years, although many supposed wolves turn out to be large feral dogs.

EASTERN BOBCAT

Lynx rufus rufus

DISTRIBUTION: Formerly common throughout most of the region but now extinct except locally in the mountainous areas where it is apparently very rare.

HABITAT: Heavily wooded regions, particularly in the vicinity of rock ledges.

NOTES: Historical accounts attest to the fact that the bobcat, wildcat, or bay lynx was once a common denizen of the regional forests. Rhoads (1903) stated that "there is a comparatively small area surrounding and north of Pittsburgh—in which the bay lynx or wildcat has become exterminated". Since that time it has disappeared from most of the region. No bounty has been paid on them in Pennsylvania since 1938.

Fayette County: In the vicinity of Markleysburg the species is said to have been abundant not more than a half century ago, and a few are said to still inhabit the wilderness about the head of Beaver Creek.

Mr. Roy Leber, who resides in that vicinity, stated that the last one he had seen killed in that section was taken four or five years ago; but he had since seen their tracks in the snow.

One was killed in Dunbar Township about January, 1948 (Game Protector T. W. Meehan).

A young female was killed along the Youghiogheny River at "Cove Hollow", about 5 miles northwest of Confluence, on January 30, 1949 (Game Protector L. B. Welch).

Cambria County: One was killed in Black Lick Township during November, 1946 (Game Protector N. M. Rhua).

Greene County: One was killed in Center Township three or four years ago (Game Protector J. E. Blair).

Indiana County: One was seen recently (December 1948 or January 1949) in Buffington Township (Game Protector G. A. Miller).

Westmoreland County: There is a mounted specimen in the Rolling Rock Club killed on Laurel Hill Mountain about 25 years ago by the late Mr. L. Weimer of Laughlintown. There have been persistent rumors that wildcats still inhabit certain of the rock ledges along the summit of Laurel Hill Mountain this county, or in Somerset County; but we were unable to confirm any of these reports.

Somerset County: Game Protectors M. M. Crooks and E. W. Cox saw one on State Game Lands No. 82, about seven miles east of Meyersdale on June 10, 1949.

SOUTHERN WOODCHUCK

Marmota monax monax

DISTRIBUTION: More or less common in all of the counties of the region.

HABITAT: Forest edge and open fields, particularly where there is good interspersion of brush with grasses and other herbaceous plants. Favorite den sites are the brushy borders of woodland bordering on meadows or cultivated fields, brushy fencerows, and islands of brush or of stone piles in open fields.

NOTES: The woodchuck, or groundhog, is one of the best known of all of our wild animals. It is highly prized by the hunter who seeks it with a high-powered rifle; and often as equally despised by the farmer, whose crops are often damaged, and whose livestock is endangered by accidentally stepping into one of the animal's dens. Old woodchuck dens are often appropriated by skunks and foxes, and they provide highly important winter retreats for the cottontail rabbit (Gerstell, 1939).

While the woodchuck is adapted primarily for life in and on the ground, it does at times climb trees, either to escape danger or entirely of its own volition. In the fall they become extremely fat, and with the approach of cold weather they retire into their dens and enter a state of hibernation. Rarely are they seen abroad between the middle of November and the latter part of February or early March.

While the woodchuck is generally common, we found it to be very scarce in the central part of Cambria County during the summer of 1948. There were many old dens, and some which apparently had been in use earlier in the year. Residents of that section also stated that groundhogs had been common there during the previous year. On August 20, we collected a young female which had been feeding along a highway. It was in a very poor physical condition, greatly emaciated and "pot-bellied", yet it seemed to be feeding normally. Examination disclosed that a very large fly larva was present in its nasal sinuses, having formed a cavity 38 mm. in depth by destroying the entire nasal septum. This animal was the only woodchuck seen during our six weeks' stay in that section.

FOOD HABITS: Woodchucks frequently travel up to a hundred yards or more from their dens in order to reach choice feeding areas, but they are constantly on the alert and rush for their dens at the slightest premonition of danger. They feed on a variety of succulent vegetation and are particularly fond of clovers and other legumes. In wooded sections they frequently feed along the highways where various clovers and sweet clovers are usually common. Corn fields within their range are sometimes damaged severely during the late summer months, for they seem to have a decided appetite for "roasting ears".

BREEDING: Breeding evidently takes place in March, shortly after these animals terminate their hibernation. Two females, taken in Westmoreland County on April 9, 1949, were both pregnant. One contained 4 embryos averaging 30 mm in length; the other contained 5 embryos of the same size. The young are born in late April or early May.

SPECIMENS TAKEN: 11—Cambria 1, Fayette 3, Greene 1, Somerset 3, Westmoreland 3.

MEASUREMENTS: Average 3 males; total length 519.7 mm, tail length 122.5 mm, hind foot 82 mm; weight 6 lbs., 4 ozs. Average 7 females; total length 589.2 mm (515-625 mm), tail length 136.3 mm (115-148 mm), hind foot 83.7 mm (72-93 mm); average weight of 3 females 7 lbs., 4 ozs.

FISHER'S CHIPMUNK

Tamias striatus fisheri

DISTRIBUTION: Occurs in all of the counties of this region, in both the Pittsburgh Section and the Allegheny Mountains Section of the Appalachian Plateau Province.

HABITAT: Usually wooded or semi-wooded areas, particularly in rocky situations or where fallen logs and old stumps are prevalent. They frequently live along brushy fencerows between cultivated fields. Cut-over woodland with an abundance of brush, stumps, shrubs, and coppice constitute an optimum habitat.

NOTES: Specimens collected from various parts of the region have been identified by Dr. J. Kenneth Doult as belonging to this race. Included were a number of specimens taken at high elevations on Laurel Hill Mountain (2,910 feet), and in the elevated plateau region of Somerset County.

While the chipmunk is rather widely distributed, we found it to be only locally common to abundant. Our observations indicated that a dependable food supply was the principal factor governing their distribution. Chipmunks were usually found in those sections where oaks, hickories, hazelnuts, or wild black cherry trees were common. They were very scarce or entirely absent in young stands of beech and sugar maple forest, or in the hemlock forest association. Suitable cover and den sites were generally available.

Chipmunks usually went into hibernation between late October and mid-November, depending on the weather conditions. On warm days, even in the middle of the winter, occasional chipmunks were seen. They emerged from their hibernation between mid-February and early March; but reverses in the weather, such as occurred during the month of March 1949, frequently terminated their activity. In Washington and Beaver counties, we observed no chipmunks until the first week of May in 1948; but thereafter a considerable amount of activity was noted.

FOOD HABITS: The chipmunk feeds extensively on a variety of seeds, nuts and tubers; but it also varies its diet by including such items as insects and snails. During the late summer and fall months they are extremely active gathering seeds and nuts for their winter food supply. The seeds or "pits" of the wild black cherry (*Prunus serotina*) are apparently a very choice item on the chipmunk's menu. In Somerset County, on August 13, 1947, we observed these little animals climbing thirty feet or more into the wild cherry trees to obtain the unripened fruits. One which we collected on November 5, 1948, had a total of 62 of the cherry seeds in its cheek pouches, all of which had the hard outer covering removed. The acorns of all species of oaks are a staple food, and many of the specimens which we collected had one or more of them in their cheek pouches. During September 1947 we collected one which was carrying an earthworm in its mouth, and another which was carrying a salamander (*Plethodon glutinosus*).

SPECIMENS TAKEN: 51—Beaver 2, Cambria 1, Fayette 4, Greene 2, Indiana 1, Somerset 32, Westmoreland 9.

MEASUREMENTS: Average 22 males; total length 223.2 mm (210-246 mm), tail length 83.6 mm (69-92 mm), hind foot 34.2 mm (31-36 mm); weight 20 males, 86.7 grams (60.0-107.5 grams). Average 18 females; total length 226.3 mm (210-240 mm), tail length 84.9 mm (71-92 mm), hind foot 33.8 mm (31-36 mm); weight 13 females, 88.1 grams (68.0-107.5 grams).

NORTHEASTERN CHIPMUNK

Tamias striatus lysteri

DISTRIBUTION: Unknown, but probably in parts of the Allegheny Mountains at least in Cambria County.

HABITAT: Apparently similar in all respects to the habitats occupied by Fisher's Chipmunk.

NOTES: Arthur H. Howell, in his work on the "Revision of the American Chipmunks" (North American Fauna No. 52), cites two specimens from Summit, Cambria County, which he referred to this race. These specimens are in the collection of the Carnegie Museum.

SOUTHERN RED SQUIRREL

Tamiasciurus hudsonicus loquax

DISTRIBUTION: Occurs in all of the counties of the region, but more common and more widely distributed in the Allegheny Mountains Section than elsewhere.

HABITAT: Most numerous in areas where coniferous trees predominate, but occasionally found in purely deciduous forests.

NOTES: The red squirrel is probably not native to the extreme southwestern part of our region. It has apparently been introduced in many city and village parks, from which it has spread into the surrounding country. Even in the Allegheny Mountains Section we have seldom found them except in areas where white pines or hemlocks were more or less common.

Although these squirrels are active at all seasons of the year, we have noticed that they usually tend to "den up" during periods of particularly severe winter weather.

FOOD HABITS: Red squirrels feed extensively on the seeds of pines and hemlocks whenever they are available. In Somerset County we observed them cutting green cones from the white pine trees during the latter part of August, and most of our specimens were well smeared with pine tar. Wherever these squirrels were at all common, we invariably found little piles of chewed up pine or hemlock cones on the stumps and logs. They also feed on the seeds of various other trees, and at times they may be forced to subsist almost entirely on red oak acorns and beech-nuts. During the winter of 1947-1948, red squirrels were abundant about a pine plantation on the summit of Laurel Hill Mountain; but the following year we observed very few at that locality. There was a good crop of cones on the pines in the fall of 1947, but practically no cones were available in the fall of 1948. Apparently most of the squirrels inhabiting that area had moved out sometime during the summer of 1948, after the cone supply became exhausted. In the late summer months we have found these squirrels eating the fruits of the wild black cherry (*Prunus serotina*). Various kinds of mushrooms are eaten during the summer months, and many are hung in the forked branches of trees where they are apparently left to dry.

The red squirrel apparently varies its diet of seeds and mast with a little meat on occasions. It has frequently been accused of robbing birds' nests and eating the eggs and young, but we made no observations on that point. Many of our specimens were taken in rat traps baited with bacon, and nailed to the trunks of trees.

BREEDING: Three females containing embryos were taken during the late summer. One containing 2 large embryos was taken in

Somerset County on August 21, 1947. In Cambria County a female with 7 embryos averaging 6 mm in length was taken on July 21, 1948; and another with 3 embryos averaging 30 mm was taken on August 9. Another female taken on August 18, in the latter county, had 7 placental scars, only two of which were recent. There are probably two broods a year—one in the late spring or early summer, and another in the late summer or early fall.

SPECIMENS TAKEN: 24—Cambria 10, Fayette 4, Somerset 6, Westmoreland 4.

MEASUREMENTS: Average 14 males; total length 313.3 mm (300-335 mm), tail length 128.0 mm (117-143 mm), hind foot 48.9 mm (46-52 mm); weight 9 males 187.3 grams (151.0-208.5 grams). Average 12 females; total length 315.2 mm (298-336 mm), tail length 131.1 mm (125-144 mm), hind foot 48.8 mm (45-52 mm); weight 8 females 206.2 grams (152.0-243.5).

NORTHERN GRAY SQUIRREL

Sciurus carolinensis leucotis

DISTRIBUTION: Occurs in all counties of the region.

HABITAT: Mature forests of hardwoods, or of mixed hardwoods and conifers, providing mast-producing trees such as oaks, hickories and walnuts are present.

NOTES: The gray squirrel was extremely abundant in this region during the period when there were extensive mature forests. At times, following the failure of the mast crop in one section, the squirrels would move en masse to new feeding grounds, crossing rivers and mountains with impunity. So great were their numbers, and so severe the damage they did to the crops on the pioneer farms, that during the early part of the last century a bounty was paid on them.

The destruction of the old growth forests greatly reduced the habitat suitable for this animal. Brush and woodland which is too immature to provide a food supply in the form of mast is not habitable by squirrels on a year round basis. Any hunter knows that the "big woods" is a good place to look for squirrels when there is a crop of hickory nuts and acorns. We saw exceedingly few of these animals in the predominantly immature beech and maple forests of central Cambria County during the summer of 1948. On the other hand, gray squirrels were fairly common in other parts of southwestern Pennsylvania where the forests were predominantly oak, or oak and hickory. This animal is primarily dependent upon the occurrence of mast-producing trees.

FOOD HABITS: While the gray squirrel feeds on a variety of fruits and seeds, acorns and nuts are really its "bread and butter". Acorns, hickory nuts, hazelnuts, black walnuts and butternuts are staple items in its diet. Hickory nuts, in particular, are often cut in the late summer while they are still quite green. We observed them cutting hickory nuts in Somerset County as early as August 10, 1947; and we have noted this early cutting of hickory nuts in other sections. In the late summer the fruits of the wild black cherry (*Prunus serotina*) are extensively eaten.

We have also observed a rather general utilization of the fruits of the cucumber tree (*Magnolia acuminata*) and of the tulip tree (*Liriodendron tulipifera*) in the Laurel Hill Mountain. The small nutlets of the blue beech (*Carpinus caroliniana*) are sometimes eaten; and the seeds of hawthorns (*Crataegus* sp.) are apparently relished, although the pulpy part is usually discarded. Corn fields in proximity to woodlands are visited regularly during the late fall and winter months. In the spring this squirrel often eats the fruits of the elm trees, and it seems to enjoy the fresh green buds of many kinds of trees.

The gray squirrel stores up quantities of nuts in the fall of the year. It does not cache them in a few places, but scatters them singly over the forest floor. It retrieves many of them, but not all, and for that reason the squirrel is perhaps the greatest agency in the dispersal of nut-bearing trees.

SPECIMENS TAKEN: 11—Fayette 1, Greene 3, Somerset 6, Westmoreland 1.

MEASUREMENTS: Average 3 males 467.0 mm (442-502 mm), tail length 208.0 mm (193-237 mm), hind foot 64.0 mm (58-69 mm); weight of one male 1 lb., 5 oz. Average 7 females; total length 476.6 mm (462-492 mm), tail length 226.7 mm (220-236 mm), hind foot 67.1 mm (62-74 mm); average weight of 3 females 1 lb., 1 oz. (12 oz.-1 lb. 5 oz.).

WESTERN FOX SQUIRREL

Sciurus niger rufiventer

DISTRIBUTION: Most common in the extreme southwestern portion of the region (Washington and Greene counties), where it is probably native. Rather rare and local east of the Allegheny and Monongahela rivers, where the species has apparently been introduced.

HABITAT: Mature but relatively open woodlands with a fair percentage of mast producing trees.

NOTES: The fox squirrel prefers open or park-like upland woods to extensive and heavily forested sections. It not uncommonly occurs in pasture fields where there are only scattered large trees, or along fence-rows between cultivated fields if some large trees have been left standing. Much apparently optimum habitat for this squirrel occurs in Greene and Washington counties where the oak and hickory woods have been extensively grazed by large herds of sheep. It is entirely possible that the fox squirrel originally migrated into this region following the large-scale introduction of sheep. We have never seen it anywhere in the extensively forested sections, nor is it very often found in the bottomland forests of Greene and Washington counties, where the groundcover is usually rather dense.

In past years small numbers of fox squirrels, ranging up to two dozen individuals, have been introduced into every county within this region. In a few localities they seem to have persisted, but most of the introductions have not been too successful.

SPECIMENS TAKEN: 3—Greene 1, Somerset 2.

MEASUREMENTS: One male; total length 518 mm, tail length 237 mm, hind foot 73 mm; weight 2 lbs. One female; total length 530 mm, tail length 261 mm, hind foot 72 mm; weight 1 lb., 12 oz.

ALLEGHENY FOX SQUIRREL

Sciurus niger vicinus

DISTRIBUTION: Unknown, but probably throughout the Allegheny Mountains Section during former years. Now evidently rare and local.

HABITAT: Presumably the forested, mountainous portions of the region.

NOTES: Rhoads (1903) recorded the occurrence of *Sciurus niger neglectus* from Fayette County. According to Poole (1944) the name *neglectus* properly belongs to a coastal plain form of the fox squirrel and those native to the Appalachian Highlands should be regarded as the race *vicinus*, described by Outram Bangs in 1896. On June 6, 1949, we observed a large, buffy-brown squirrel on Glade Mountain, Elk Lick Township, Somerset County. This individual was most certainly a fox squirrel, but it did not at all resemble individuals of the race *rufiventer* which were observed and collected in the extreme southwestern counties. Residents of this Somerset County section claim that fox squirrels are seen occasionally, but they are quite rare. It is possible, of course, that squirrels of the present race may still exist in some parts of the region.

EASTERN FLYING SQUIRREL

Glaucomys volans volans

DISTRIBUTION: Occurs in all counties of the region.

HABITAT: Forests or woodland. Optimum habitats are those having mature mast-producing trees such as oaks, beech, or hickories; and an abundance of natural cavities, or dead snags with old woodpecker holes.

NOTES: Flying squirrels are nocturnal in their habits, and their presence in an area is not always obvious. However, these little animals seem to be quite common in woodlands throughout the region. Their numbers seem to fluctuate from one year to another. Possibly they have a regular cycle but this has not been ascertained.

These squirrels are not strictly confined to the areas of extensive forest, for they frequently make their homes in blocks of isolated woodland, and we have known them to dwell in the large shade and street trees in the smaller towns. Although they most frequently use natural cavities or old woodpecker holes as nest sites, they sometimes use outside nests. These have been described as similar to the leaf nests of the gray squirrel but somewhat smaller. Dr. Dwight E. Sollberger, of Indiana, states that he has observed flying squirrels using such nests during the summer months. He has often seen them in tangles of grape vines, and he believes most of these nests are constructed by the flying squirrel. Clay L. Gifford says that he has seen similar outside nests in Greene County. At times the flying squirrel makes its residence in the garrets of houses and other buildings which are located in wooded areas.

FOOD HABITS: Flying Squirrels feed on various fruits and seeds. Acorns and beechnuts are staple food items, and in the fall they often cache quantities of them in cavities of trees. A specimen which we took on August 27 had been feeding extensively on the pits of the wild black cherry (*Prunus serotina*), but it had ingested very little of the pulpy part of these fruits. They probably, on occasions, vary their diet with meat. Most of our specimens were taken in rat traps baited with pieces of fat bacon, and nailed to the trunks of trees.

BREEDING: Two Westmoreland County males, taken on January 27 and February 9, 1949, had descended testes. A female taken on March 31, 1949, contained 3 embryos averaging 14 mm in length. One taken in Fayette County on May 26, 1948, showed 2 placental scars and was lactating at the time. Another female, taken in Somerset County on August 27, 1947, was quite evidently nursing young. Sollberger (1943) recorded several litters of young which he had observed during the months of April, May and August at Aliquippa, Beaver County. He found from 1 to 4 young in a litter. There are probably two litters a year.

SPECIMENS TAKEN: 19—Cambria 1, Fayette 6, Somerset 1, Westmoreland 11.

MEASUREMENTS: Average 5 males; total length 226.8 mm (217-234 mm), tail length 102.8 mm (95-118 mm), hind foot 31.4 mm (30-34 mm); weight 71.2 grams (51.0-78.0 grams). Average 9 females; total length 231.7 mm (217-239 mm), tail length 104.4 mm (93-112 mm), hind foot 31.2 mm (30-33 mm); weight 67.1 grams (54.5-81.0 grams).

NORTHERN FLYING SQUIRREL

Glaucomys sabrinus macrotis

DISTRIBUTION: Not thus far taken in any of the counties covered by this report but should be looked for in Cambria, Indiana and Somerset counties.

HABITAT: Mixed deciduous coniferous forests of the Alleghenian Faunal Area.

NOTES: The northern flying squirrel has been taken by Messrs. Harry Roslund and Cole Wilde in the vicinity of McGees Mills, Clearfield County, not very far from the northeastern corner of Indiana County. The specimens taken thus far in northwestern Pennsylvania have all been identified as belonging to the race *macrotis*. Those from the high mountains of West Virginia belong to the race *fuscus*. Hamilton (1943) states that "intergradation probably occurs in the Alleghenies of southern Pennsylvania." Although this species might reasonably be expected to occur at higher elevations in the mountains of southwestern Pennsylvania, all of the flying squirrels taken thus far on both Laurel Hill and the Negro Mountains have been *Glaucomys volans*.

CANADA BEAVER

Castor canadensis canadensis

DISTRIBUTION: Formerly throughout the region but now apparently found only in Cambria and Greene counties.

HABITAT: Streams in forested or semi-wooded areas. An available food supply in the form of aspens, willows, alders, etc., is essential.

NOTES: Before the days of colonization the beaver was probably a fairly common mammal along many of the streams of the present region. It has given its name to various places, and to several streams throughout Pennsylvania; for example, Beaver County, Beaver Creek, and Beaverdale (Cambria County). Its remains were found at all of the Indian village sites in Fayette and Somerset counties. The native beaver, however, became extinct about the middle of the last century.

In 1917, the Game Commission released a pair of beavers in Cameron County, these animals having been presented by the State of Wisconsin. Four more pairs were purchased in Canada and released in 1919, followed by the release of twenty-four additional pairs of Canadian beavers in various state game refuges in 1920. The reintroduction of the beaver was so successful that by 1934 it became desirable to harvest the surplus animals. Beaver soon spread from points of introduction to over two-thirds of the counties of the state.

At the present time there are active beaver colonies in both Cambria and Greene counties. In the latter county, Mr. Ralph Reynolds advises us that colonies are now present on Ruff Creek, Big Whiteley and on Ten Mile Creek. In past years there have been colonies elsewhere in Greene County. After a food supply becomes exhausted in the vicinity of the beaver dam, these animals move elsewhere, taking up residence in a new locality where suitable food trees and shrubs are present. A specimen in the Carnegie Museum, taken at Rector, Westmoreland County, on December 9, 1922, was evidently only an itinerant individual.

CLOUDLAND DEER MOUSE

Peromyscus maniculatus nubiterrae

DISTRIBUTION: Confined to the Allegheny Mountains Section where it is most common at higher elevations in the mountains. It is known to occur in the eastern parts of Indiana, Westmoreland and Fayette counties; and throughout Somerset and Cambria counties.

HABITAT: Most abundant in the hemlock and beech-sugar maple forest associations, and somewhat less common in the predominantly oak forests of the drier mountain ridges. It is apparently confined to the cool, damp and very rocky situations in the forest; sometimes following mountain stream valleys down into the foothills (1,060 feet in the Loyalhanna Gap through Chestnut Ridge). Unlike the northern white-footed mouse, this species is very rarely found in open places.

NOTES: The cloudland deer mouse shares its habitat in the cool mountain forests with such species as the red-backed mouse, woodland jumping mouse and the masked shrew. Although we have frequently taken the northern white-footed mouse in the same habitat as this species,

we have observed that in certain places either one or the other species is the dominant form. In habitats which were more or less optimum for the northern white-footed mouse it was apparently always the dominant species. The cloudland deer mouse, on the other hand, seemed to be the dominant form in the more severe microclimates where the northern white-footed mouse was seemingly a rather unsuccessful pioneer species. Both species of *Peromyscus* occurred on Laurel Hill Mountain and Chestnut Ridge; but the cloudland deer mouse was the dominant species at higher elevations, and in the moist, damp, and rocky stream valleys at lower elevations. The valley region between Laurel Hill and Chestnut Ridge, on the other hand, was occupied exclusively by the northern white footed mouse; and locally, in farmed sections, by the prairie deer mouse.

The habits of the cloudland deer mouse do not seem to differ in any important respects from those of the northern white-footed mouse, although it exhibits a greater penchant for climbing. We frequently took cloudland deer mice in rat traps fastened to the trunks of trees for capturing squirrels; and similar traps set around rock ledges for taking wood rats. Like the northern white-footed mice, they were often infested with warble fly larvae (*Cuterebra*) during the late summer and fall months.

FOOD HABITS: Like the northern white-footed mouse, this species feeds principally on seeds and insects during the summer months. The seeds of various trees which are common in its habitat—hemlock, birches, maples, tulip trees, beech, wild cherry and oaks—constitute the bulk of its diet.

BREEDING: Many of the males taken after mid-March were in breeding condition. A female taken on March 19, 1948 contained 5 embryos averaging 17 mm in length; but other females taken on April 2 and 4 contained embryos only averaging 5 mm in length. There are several litters during breeding season, which normally extends from late March until October. From 4 to 7 embryos were found in the animals which were examined; 4 or 5 being the more common numbers.

SPECIMENS TAKEN: 121*—Cambria 22, Fayette 13, Indiana 4, Somerset 11, Westmoreland 71.

MEASUREMENTS: Average 70 males; total length 173.1 mm (155-199 mm), tail length 90.9 mm (79-111 mm), hind feet 20.8 mm (19-22 mm), ear 18.8 mm (15-21 mm); weight 17.2 grams (13.5-21.5 grams). Average 50 females; total length 174.0 mm (152-192 mm), tail length 90.7 mm (76-104 mm), hind foot 20.4 mm (18-22 mm), ear 18.5 mm (15-21 mm); weight 18.3 grams (12.5-29.0 grams).

PRAIRIE DEER MOUSE

Peromyscus maniculatus bairdii

DISTRIBUTION: Occurs, at least locally, in all of the counties of the region.

HABITAT: Open or cultivated fields and roadside berms, with a relatively sparse groundcover of herbaceous plants, in dry and exposed situations.

*Figures given here represent only identified specimens, not the total actually collected.

NOTES: This prairie mouse has apparently entered our region from the west; and by following the grassy and weedy berms of the highways it has evidently gone from one agricultural area to another, even crossing Chestnut Ridge and Laurel Hill Mountains on its journey eastward.

We found the prairie deer mouse to be locally common in cultivated fields and along the highways of this region. Near Markleysburg, Fayette County, it was taken at an altitude of about 2,400 feet. In the north-central part of Cambria County it was common along a rocky and sparsely vegetated highway cut, situated on a hilltop and surrounded on all sides by cultivated fields. In Washington County these mice were seemingly abundant on old strip mine dumps which had been partially smoothed over, limed, and planted with sweet clovers (*Melilotus* sp.). The open and wind-swept tops of the mounds, where much bare soil and shale were still exposed, were quite evidently preferred to denser grasses and weeds occurring only a few hundred feet away in an abandoned meadow and orchard. Our experience everywhere has been that this mouse seeks open and wind-swept hilltops in preference to the valleys.

FOOD HABITS: Our observations lead us to believe that this species feeds chiefly on the seeds of such herbaceous plants as the sweet clovers, smartweeds (*Polygonum*), ragweds (*Ambrosia*), foxtail grass (*Setaria*), and perhaps various cultivated grains.

BREEDING: The breeding season apparently extends from March to October. On April 29 and 30, 1948 we took several females in Washington County which contained embryos ranging from 4 to 20 mm in length. One female, taken on April 29, had already given birth to young. A female taken on September 23, 1948, in Indiana County, contained embryos averaging 13 mm in length. Several litters seem to be produced during the breeding season. From 3 to 5 embryos were found in the females which we examined; 3 or 4 being the more common number.

SPECIMENS TAKEN: 57—Cambria 15, Fayette 6, Indiana 9, Somerset 2, Washington 18, Westmoreland 7.

MEASUREMENTS: Average 23 males; total length 142.2 mm (125-155 mm), tail length 60.8 mm (55-69 mm), hind foot 19.1 mm (18-21 mm), ear 14.6 mm (13-16 mm); weight 16.8 grams (13.0-20.5 grams). Average 25 females; total length 143.7 mm (125-155 mm), tail length 64.6 mm (50-69 mm), hind foot 18.6 mm (17-21 mm), ear 14.9 mm (14-16 mm); weight 17.5 grams (14.0-26.0 grams).

NORTHERN WHITE-FOOTED MOUSE

Peromyscus leucopus noveboracensis

DISTRIBUTION: Occurs in all of the counties of this region.

HABITAT: Usually wooded or semi-wooded areas, thickets, and brushy fencerows. During periods of high population levels it not uncommonly also occurs in fields. Rather commonly found in corn fields in the late fall and early winter where shocks are present.

NOTES: The northern white-footed mouse is one of the most abundant and widely distributed of all our mammals. During the past two

years the population level of *Peromyscus* has been relatively high throughout the region, and the northern white-footed mouse has been found in abundance in most localities. In the mountains, however, this species is very largely replaced by the somewhat similar cloudland deer mouse (*Peromyscus maniculatus nubiterrae*). During the fall and early winter of 1948, they were very abundant in corn fields both in Greene and Westmoreland counties; and in the former county we found many of them in a wet bottomland with a rank growth of grasses and sedges—a typical meadow mouse habitat.

These mice construct nests of soft plant fibers and down from such plants as the cattail, milkweed or Indian hemp. The nests are placed in hollow logs, crevices in stumps, or in the cavities of trees; but sometimes a deserted bird's nest is refurnished with down and roofed over by the mice. Occasionally, too, these mice will move into houses, cabins and outbuildings where they may become more or less of a nuisance.

In the late summer and early fall (August-October) we found that a high percentage of these mice were infested with warble fly larvae (*Cuterebra* sp.), particularly in the inguinal regions. Sometimes two or more of these warbles were present, and occasionally they were of various sizes.

FOOD HABITS: White-footed mice usually carry their food to some sheltered spot before consuming it. Under the edges of logs and stumps or beneath the projecting edges of rocks, one often sees the little piles of seed hulls which represent the refuse from some white-foot's dinner table. While primarily seed-eaters, they vary their diet during the summer months with such insects as beetles, crickets, and grasshoppers. The seeds or "pits" of various cherries, and particularly of the wild black cherry (*Prunus serotina*), constitute a dependable food supply in most localities. Seeds of a wide variety of other woody plants, and of many herbaceous plants as well, are regularly eaten. In agricultural sections corn and various small grains are extensively eaten, and at times these mice may cause much damage to grains in storage bins.

BREEDING: Many of the males taken during early and mid-March were in the breeding condition. Pregnant females were taken from early April (April 7, Beaver County) until early October (October 8, Greene County). During the early part of March, both in 1948 and 1949, we trapped a few very small juveniles. One taken at Laughlintown on March 14, 1949, weighed but 5½ grams. Several litters are born during the breeding season. From 3 to 6 embryos were found in the animals which we examined; 5 being the more common number. Several of the females taken during the summer months had very small embryos (not over 3 mm), although they were obviously still nursing litters of young.

SPECIMENS TAKEN: 254*—Beaver 12, Cambria 25, Fayette 29, Greene 14, Indiana 19, Somerset 83, Washington 13, Westmoreland 59.

MEASUREMENTS: Average of 100 males; total length 165.8 mm (142-182 mm), tail length 78.0 mm (64-90 mm), hind foot 21.2 mm (19-23 mm), ear 17.3 mm (14-20 mm); weight 21.1 grams (14.5-27.0 grams).

* Figures given here represent only identified specimens, not the total actually collected.

Average 75 females; total length 166.4 mm (144-196 mm), tail length 75.8 mm (62-94 mm), hind foot 20.9 mm (19-23 mm), ear 17.3 (14-20 mm); weight 22.3 grams (15.0-36.0 grams).

ALLEGHENY WOOD RAT

Neotoma magister

DISTRIBUTION: Confined to the mountainous portions of Cambria, Fayette, Somerset and Westmoreland counties. Rather local in its occurrence within this range.

HABITAT: Rocky cliffs, or accumulations of residual sandstone blocks and boulders, in forested areas.

NOTES: The wood rat, or cave rat, is locally common in the mountains of southwestern Pennsylvania. Favorite haunts are the cliff-like outcroppings of sandstone rock that appear here and there along our mountain ridges. There, in the cavernous recesses and labyrinthine passageways among the huge boulders, it forages by night; often making short excursions into the surrounding forest in quest of food.

The bulky nests of the wood rat are placed in crevices among the rocks and often on some ledge sheltered by an overhanging rocky roof. They are composed of sticks and other dried vegetation. There are usually miscellaneous piles of vegetation and other debris about the rock ledges where this animal occurs, some of which undoubtedly represent reserve supplies of food. At one locality we found about a half peck of dried puffballs and other mushrooms, fragments of hornet's nests, and bits of paper which were stored in a cave-like recess among the rocks. Well-defined defecating posts are usually maintained at some distance from occupied nests.

Occasionally this animal takes up its abode in buildings. During the fall of 1947 a young female built a nest on top of a roll of wire fencing which was stored in an open shed at the game refuge headquarters in the Lynn Run valley. Besides the usual sticks and branches it contained several old corn cobs, and nearby was a double handful of the berries gathered from the Japanese barberry. At times these rodents actually become a nuisance about cabins located in the mountain forests.

FOOD HABITS: Wood rats feed on a variety of herbaceous vegetation, bark, and fruits found in the woods about the rock ledges. Leafy twigs and branches of various trees and shrubs are often cached among the rocks or placed upon the nests. Some of this material, including the fronds of several species of ferns, are often deliberately cured and are probably used as food during the winter season. Wild grapes and other fruits are eaten extensively when they are available. We found evidence that wood rats, at least occasionally, enjoy a meat diet. Near one nest we picked up a partially eaten body of a meadow mouse. On another occasion we repeatedly had the pieces of rabbit disappear from fox sets. When the large steel traps were replaced by rat traps, two specimens of *Neotoma* were taken.

BREEDING: The young are apparently born during late April or early May. We found no evidence that there is more than a single litter during the year. Females taken in the southern part of Fayette County

during the latter part of May and the month of June had given birth to young, but we found no sign of a second litter in any of the animals trapped. A female taken on April 8, 1949 in Westmoreland County, contained only two embryos. One of these was 39 mm in length, but the other measured only 20 mm and was apparently in the process of being resorbed. Five probably constitutes the average number of young in a litter. Three of the females taken in Fayette County showed five placental scars; one had seven, and another only three. Juvenile individuals about the size of ordinary Norway rats were taken during the latter part of June in Fayette County.

SPECIMENS TAKEN: 24—Fayette 14, Westmoreland 10.

MEASUREMENTS: Average 6 males; total length 442.8 mm (432-460 mm), tail length 206.7 mm (195-215 mm), hind foot 44.8 mm (42-46 mm); weight 404.3 grams (353.5-447.0 grams). Average 10 females; total length 416.9 mm (395-446 mm), tail length 192.0 mm (176-201 mm), hind foot 42.8 mm (40-45 mm); weight 352.9 grams (286.0-422.0 grams).

GAPPER'S RED-BACKED MOUSE

Clethrionomys gapperi gapperi

DISTRIBUTION: Confined to the Allegheny Mountains Section. It is found from northern and central Indiana County southward through the western portions of Westmoreland and Fayette counties, and eastward throughout most of Somerset and Cambria counties.

HABITAT: Cool, moist and usually very rocky situations in the forests of the Alleghenian Faunal Area. Optimum habitats are the moist and rocky places with a profusion of mosses and ferns in the understory. It is most abundant in the hemlock forest, beech-sugar maple forest, and hemlock-birch-rhododendron associations; and somewhat less common in the oak forest association of the mountain ridges. Apparently suitable habitats in many of the ravines of the region to the west of Chestnut Ridge and south of Indiana County are evidently not occupied by the species.

NOTES: Red-backed mice are strictly creatures of the forest in our region and they very seldom, if ever, come into conflict with man's interests. Occasionally we have taken them in very small clearings, into which they had quite evidently wandered from the surrounding forest. In the latter situations they sometimes come into contact with the meadow mouse. Red-backed mice are active both by day and night; but a very high percentage of the specimens taken by us were trapped between the hours of sunset and sunrise, indicating a somewhat greater activity at night. Rather high populations of these mice were found locally on Laurel Hill Mountain and Chestnut Ridge in the eastern part of Westmoreland County during the winters of 1947-1948 and 1948-1949.

FOOD HABITS: These mice evidently feed on a variety of the herbaceous plants occurring in their forest habitat; as well as on the seeds of various forest trees. Fragments of fern fronds, particularly of the shield fern (*Dryopteris intermedia*) and the New York fern (*Dryopteris*

noveboracensis) were very commonly found in the subterranean runways among the rocks. The former species of fern, having evergreen fronds, seems to be one of the most important foods of this mouse during the period from late fall until mid-spring.

BREEDING: The breeding season apparently begins during the latter part of March or early April. In 1949 we found the first embryos on April 4, on which date a female was taken with 6 embryos measuring 2 mm in length. The first litters of young seem to be born during late April or early May. There is a succession of litters throughout the summer and fall months. No evidences of embryos were noticed in specimens taken during November, however. Several very small juveniles, hardly more than two weeks old, were taken during the third week of May. From 3 to 6 embryos were found in the animals examined, 4 being the average number.

SPECIMENS TAKEN: 337—Cambria 4, Fayette 35, Indiana 16, Somerset 69, Westmoreland 213.

MEASUREMENTS: Average 86 males; total length 137.0 mm (119-155 mm), tail length 41.0 mm (34-50 mm), hind foot 19.4 mm (17-21 mm); weight 26.4 grams (14.5-38.0 grams). Average 104 females; total length 137.7 mm (117-162 mm), tail length 40.3 mm (31-50 mm), hind foot 18.6 mm (17-21 mm); weight 26.7 grams (16.5-44.0 grams).

STONE'S LEMMING MOUSE

Synaptomys cooperi stonei

DISTRIBUTION: Probably occurs in all counties of the region.

HABITAT: In our region the lemming mouse was almost invariably found in dry hillside fields. In other parts of its range this mouse is said to inhabit sphagnum bogs, and it is often called the "bog lemming", but we failed to take even one specimen in any of the sphagnum bogs in this region. One juvenile was taken along the dry edge of a glade in the southern part of Fayette County, but no other specimens were taken in the wetter part of the area. Typical habitats were old fields with an interspersed of such shrubs as hawthorn and blackberry, but with a fairly dense groundcover of grasses such as the bluegrass, timothy, redtop, orchard grass and wild oat grass. Specimens were taken in one old field on Laurel Hill Mountain at an elevation of 2,600 feet.

NOTES: At the present time the lemming mouse seems to be very scarce throughout this region, and we found it to be very local in its distribution. Many apparently suitable habitats were trapped or examined, but in only a few places were any specimens taken. Many fields appeared to have had a rather fair-sized population of these mice within recent years, however. Wherever we did find them they were never numerous, but always seemingly concentrated in small areas. At no time were they evenly distributed throughout the habitat, although we could detect no obvious differences between the occupied and unoccupied areas. In the southern part of Fayette County one individual was taken in the grass and weeds growing along the berm of a road through a wooded section; in the western portion of Somerset County, another was

taken along the old woods road, leading through a forest area where the trees had been leveled by a tornado. Here there was a very scant cover of grass and other herbaceous vegetation.

FOOD HABITS: During the spring and summer months the lemming mouse feeds on various grasses and sedges. We were unable to obtain any information regarding its food during the winter season. Mr. Clay L. Gifford states that he has often taken them about corn shocks in Greene County during the winter months.

BREEDING: One female, taken in Westmoreland County, on March 22, 1948, contained 3 embryos which averaged 4 mm in length. One found dead on a road in Greene County on October 14, 1948, but obviously killed several days before, was apparently lactating. As in other species of microtines, the breeding season probably is continuous, extending from the early spring to late fall.

SPECIMENS TAKEN: 9—Fayette 2, Greene 1, Somerset 1, Washington 3, Westmoreland 2.

MEASUREMENTS: Average 5 males; total length 113.6 mm (110-116 mm), tail length 20.6 mm (19-22 mm), hind foot 18.8 mm (18-19 mm); weight 26.2 grams (20.0-31.5 grams). Average 3 females; total length 114.7 mm, tail length 19.0 mm, hind foot 18.7 mm; weight 23.8 mm.

PENNSYLVANIA MEADOW MOUSE

Microtus pennsylvanicus pennsylvanicus

DISTRIBUTION: Occurs throughout all counties of this region.

HABITAT: Optimum habitats for this species are the expanses of un-pastured meadows and swale areas with a variety of grasses, rushes, sedges and other herbaceous plants. It is most abundant in farming sections. In the forested sections it often is found in isolated clearings and swale or bog areas, where grasses, sedges and other herbaceous vegetation form a rather dense groundcover. It occurs at all altitudes, providing a suitable habitat is available.

NOTES: The meadow mouse, frequently called the "field mouse" or the "bull mouse", is familiar to farm boys everywhere. During their periods of abundance—for it seems to be a highly cyclic species—they are almost universally present about the farm, in the meadows, in the grain fields and along every unmowed fencerow. During the past two years, however, the meadow mouse population seems to have been very low throughout practically all of southwestern Pennsylvania. During this period, we examined many areas which we considered optimum habitat for the species; and although we found many indications of former abundance, we found little evidence of present occupancy.

During this period of low population level the mice were found to be concentrated in certain small areas. In many instances they were not uniformly distributed over a meadow, but confined to small pockets, such as the damper areas with rank growths of grasses, sedges and common rush (*Juncus effusus*). We examined many areas—hay meadows in the farming regions and wet sedge-grass marshes; and although we found

an abundance of old runways, old cuttings and old piles of scats, we seldom obtained many meadow mice. Occasionally we picked up one or two individuals, or found small concentrations of these mice in the small clearings and bog areas in the mountain forests.

The meadow mouse is consumed by all of the predatory birds and mammals and is an important buffer species as far as game species are concerned. They formed a very high percentage of the food of the red fox, gray fox, mink and weasel in this region in spite of the current low population level.

FOOD HABITS: When meadow mice are abundant, they often cause serious damage to various agricultural crops. Apple orchards and nursery plantings—even of conifers—are sometimes damaged by the mice eating the bark and girdling the trees, particularly during the winter season when the ground is covered with snow. Grasses of many species, sedges, rushes and various other herbaceous plants are eaten by these mice. To reach the more succulent portions the taller stalks are cut down and then cut up into short sections. Such cuttings are generally common in areas where the mice are at all numerous.

BREEDING: During mild winters, such as that of 1948-1949, meadow mice seem to breed throughout the year. Pregnant females were taken on December 14, 1938 and on March 5, 1949. One taken on October 25, 1948 contained 5 embryos which were only 2 mm in length. In the middle of December, of the same year, we took a number of juvenile individuals which were evidently from litters born rather late in November. Several of the females taken during the summer months were apparently nursing young, or had just completed doing so, yet they contained small embryos. According to Hamilton (1943) litters are born every five weeks during the breeding season. Specimens which we examined contained from 3 to 9 embryos, with 5 being the average number in a litter.

SPECIMENS TAKEN: 173—Beaver 13, Cambria 7, Fayette 13, Greene 10, Indiana 4, Somerset 58, Washington 20, Westmoreland 48.

MEASUREMENTS: Average 57 males; total length 155.6 mm (139-177 mm), tail length 45.5 mm (38-59 mm), hind foot 20.6 mm (18-23 mm); weight 41 males, 37.8 grams (25.0-51.0 grams). Average 64 females; total length 155.5 mm (139-178 mm), tail length 44.5 mm (38-55 mm), hind foot 20.4 mm (17-22 mm); weight 49 females 37.9 grams (22.0-52.5 grams).

NORTHERN PINE MOUSE

Pitymys pinetorum scalopsoides

DISTRIBUTION: Probably occurs in all counties of the region.

HABITAT: In our region the pine mouse is strictly a woods inhabiting species. Optimum habitat appears to be in deciduous forest with deep loamy or sandy soils, such as commonly occur on the floodplains of the rivers and creeks. In the Lynn Run valley, on the western slope of Laurel Hill Mountain, Westmoreland County, it was taken up to 2,000 feet.

NOTES: The pine mouse seems to be very rare and local in its occurrence, at least in our region at the present time. Whether or not they have had periods of unusual abundance we cannot say. In some other parts of the country pine mice are known to occur in field areas, but here we have only found them in wooded areas. In their present apparent state of scarcity, and owing to the fact that they are strictly confined to the woods, they are of no immediate significance to man. However, in some parts of their range, particularly during their periods of abundance, they have caused very extensive damage to orchards.

Pine mice seem to spend the greater part of their time in their subterranean burrows, and most of the specimens taken by us were obtained by placing the traps directly in their opened runways. They apparently lead a very mole-like existence. Their fur is soft and mole-like, their eyes are very small and their ears are all but concealed in the fur.

FOOD HABITS: Pine mice are known to feed extensively on the roots of many plants, including those of various trees and shrubs. Root-stocks of the violets are said to be one of their favorite foods, and we found violets to be common in most of the places where we have taken specimens of this mouse.

BREEDING: The few specimens of pine mice taken by us revealed very little information regarding their breeding habits. A female taken in Westmoreland County on March 12, 1948 contained but a single embryo which measured 15 mm in length; and another taken in Beaver County on May 10, 1948 contained 3 embryos measuring 15 mm in length. Apparently the pine mouse, in this region, is a much less prolific breeder than either the meadow mouse or the red-backed mouse. The breeding season probably continues until the late fall in this region, as it is known to do elsewhere.

SPECIMENS TAKEN: 9—Beaver 3, Fayette 1, Somerset 1, Westmoreland 4.

MEASUREMENTS: Average 6 females; total length 123.7 mm (110-132 mm), tail length 24.2 mm (21-29 mm), hind foot 17.0 mm (16-18 mm); weight 29.5 grams (28.0-30.5 grams). One male measured; total length 137 mm, tail length 20 mm, hind foot 18 mm; weight 32.0 grams.

COMMON MUSKRAT

Ondatra zibethica zibethica

DISTRIBUTION: Occurs in all of the counties of the region.

HABITAT: The shoreward margins of ponds, banks of streams and marshes. In our region practically all of the muskrats dwell along the streams, making their burrows in the stream banks. Locally there are small marshy areas and old mill ponds with marshy borders, where houses are occasionally constructed. The rocky-bedded, fast-flowing streams of the forested mountain sections are not suitable as muskrat habitat. Slow-flowing streams, with an abundance of herbaceous vegetation along their banks, constitute the principal muskrat habitat in our region.

NOTES: In former years the muskrat was a common inhabitant of all of the rivers and creeks in this region, outside of the strictly mountainous areas; but the progressive pollution of the regional water-courses has greatly restricted their distribution in more recent years. It is still fairly common along most of the unpolluted streams, and it is today the most popular of all of our fur-bearers. The pelt of a muskrat in recent years has usually brought as much, or even more, than that of a fox, skunk or raccoon.

It is much easier to decimate a population of stream-dwelling muskrats than it is to seriously overtrap the marsh-dwelling populations. In some sections overtrapping has resulted in a marked decrease of the animals in recent years. Mr. Andrew Ewart, of Carmichaels, stated that he and three other trappers took 500 muskrats along Muddy Creek, Greene County, about ten years ago; in the season of 1947-1948 only 30 muskrats were taken along that section of the stream. Overtrapping, rather than predation, is blamed by most Greene County trappers for the scarcity of muskrats in recent years.

The pelt of the muskrat does not become prime until about February, at the time when the mating season begins. Consequently many of the pelts are badly damaged at that season of the year, due to intraspecific strife. Fur dealers and trappers generally agree that the unprime early winter pelts are more valuable than badly cut-up prime pelts would be, and for that reason it is desirable to keep the trapping season during the months of December and January.

During the month of December 1947, three white muskrats were taken near Holbrook, Greene County; but neither albinism nor melanism seem to be at all common in this region.

Man, it is claimed, exerts the greatest influence on muskrat populations in this region; and this is undoubtedly very true. Among their natural enemies are the mink, foxes and great horned owls. Droughts often expose them and result in excessive predation. Floods, on the other hand, may cause serious losses by drowning, particularly of the young animals in the bank dens.

FOOD HABITS: The muskrat feeds on a wide variety of herbaceous vegetation found along the creek banks, or occurring in the marshy areas. The various species of grasses, sedges, rushes, plantains and clovers are all eaten with avidity. Wherever the cattail (*Typha latifolia*) and the bur-reeds (*Sparganium* sp.) occur, they are eaten rather extensively. Corn fields in proximity to waters inhabited by muskrats are almost certain to be raided by these animals during the late summer and fall months; and truck gardens in bottomlands near streams have sometimes suffered severely from raiding muskrats. The bark of trees, such as the willow and box-elder (*Acer negundo*), are sometimes eaten during the winter months when other foods may be scarce. They are not, however, strictly vegetarians. The fresh-water mussels, so common in many of the regional streams, are very much relished by the muskrat.

BREEDING: Our breeding data is too meager to be conclusive, but we found no evidence that muskrats have the breeding potentiality that is sometimes claimed for them. A large female taken in Somerset County on August 29, 1947 showed 11 placental scars—undoubtedly repre-

senting the number of young in the two litters born that spring and summer—but there was no evidence of a third litter. No embryos were found in a total of six other females taken between the latter part of August and the third week of October. It was quite evident that the females of early spring litters do not breed during their first year. From 4 to 6 young are usually produced in a litter.

SPECIMENS TAKEN: 31—Greene 19, Somerset 10, Westmoreland 2.

MEASUREMENTS: Average 9 males; total length 566.6 mm (524-630 mm), tail length 267.6 mm (246-295 mm), hind foot 80.2 mm (75-85 mm); average weight 2 males 1,139 grams. Average 8 females; total length 546.8 mm (511-580 mm), tail length 255.4 mm (238-270 mm), hind foot 78.6 mm (77-81 mm).

HOUSE MOUSE

Mus musculus musculus

DISTRIBUTION: Occurs throughout the region.

HABITAT: More or less common everywhere about human habitations, barns, and granaries. Locally common in fields and occasionally present in wooded areas, particularly during the warmer months of the year.

NOTES: House mice are generally common as pests about buildings, but they were also locally common in fields and wooded areas during the summer months. We took a specimen in the hemlock-birch-rhododendron association along the Youghiogheny River below Ohio-pyle, Fayette County, that was at least a quarter of a mile from any human habitation. In Greene County, during October 1948, we found house mice to be very abundant in the cornfields; and on one occasion we took several from the wet sedge-grass meadow surrounding an old abandoned house. Locally these mice were almost as common as the white-footed mice, and they were very much more numerous than the meadow mice in Greene County.

SPECIMENS TAKEN: 54—Cambria 4, Fayette 2, Greene 20, Indiana 18, Somerset 10.

MEASUREMENTS: Average 8 males; total length 162.6 mm (155-175 mm), tail length 84.6 mm (78-95 mm), hind foot 17.8 mm (17-18 mm); weight 15.3 grams (11.5-18.5 grams). Average 5 females; total length 164.0 mm (156-171 mm), hind foot 18.0 mm (17-19 mm); weight 19.4 grams (18.0-21.5 grams).

NORWAY RAT

Rattus norvegicus

DISTRIBUTION: Occurs throughout the region.

HABITAT: More or less common everywhere about human habitations, farm buildings, rubbish dumps, etc. Locally common in fields and along streams.

NOTES: The Norway or brown rat is an immigrant. It has followed man to every part of the world; taking up its abode wherever he has settled or erected buildings—in the big cities and in the most remote rural areas. Perhaps no other species of mammal can match the rat's record of destructiveness, or its potentiality for spreading filth and disease. It stands alone as an utterly worthless creature, bitterly despised as one of the worst enemies of man.

We have often taken this rat in fields in the vicinity of farm buildings, and occasionally it has been known to wander far from human habitations of any kind. Tracks of this rat are often common along streams—particularly along the most filthy of polluted streams—and usually in the neighborhood of towns and villages. We have never found any indication of their presence along streams of the wilder mountainous areas.

SPECIMENS TAKEN: 6—Indiana 2, Somerset 1, Westmoreland 3.

MEADOW JUMPING MOUSE

Zapus hudsonius hudsonius

DISTRIBUTION: Occurs in all of the counties of the region.

HABITAT: Usually open places such as meadows or grain fields, swales, and thickets in proximity to open fields. Moist bottomlands are preferred to dry hilltop sites. It is occasionally found in open woodlands with a dense groundcover of grasses and other herbaceous vegetation.

NOTES: While the meadow jumping mouse is rather widely distributed, it was very seldom found to be really common. This mouse seems to be well-known to rural residents throughout the region; and many persons either gave us descriptions of it, or told us about the "kangaroo mouse" which they had seen in the hayfield. No other small rodent seems to evoke the popular interest as much as the dainty little meadow jumping mouse.

Like their relatives, the woodland jumping mice, these creatures hibernate for about half of the year. In the southern part of Beaver County we took our first specimens on April 30, 1948; and in early May they appeared to be very active. The latest date on which we have taken a specimen in the fall was October 6, 1948 in Greene County.

FOOD HABITS: The meadow jumping mouse feeds on the seeds of various grasses and other herbaceous plants, as well as on small fleshy fruits such as wild strawberries. We have never heard any complaints of their damaging agricultural crops.

SPECIMENS TAKEN: 13—Beaver 5, Cambria 2, Greene 1, Indiana 4, Washington 1.

MEASUREMENTS: Average 9 males; total length 201.7 mm (185-215 mm), tail length 122.3 mm (110-134 mm), hind foot 28.8 mm (27-30 mm); weight 17.5 grams (15.0-19.5 grams). Average 6 females; total length 207.1 mm (202-212 mm), tail length 126.0 mm (119-133 mm), hind foot 29.0 mm (28-30 mm); average weight 3 females, 17.5 grams.

WOODLAND JUMPING MOUSE

Napaeozapus insignis insignis

DISTRIBUTION: Limited to the counties of the Allegheny Mountains Section. It is known to occur in Cambria, Fayette, Indiana, Somerset and Westmoreland counties.

HABITAT: Cool, moist forests, usually in the stream valleys. It is apparently most numerous in the hemlock-hardwood forests and in rhododendron thickets.

NOTES: We found the woodland jumping mouse to be quite local in its occurrence, as we did not find it in all of the habitats which appeared to be suitable for it. Although it was locally fairly common, it was nowhere really abundant. Usually this rodent was found in the same habitat as the cloudland deer mouse, the red-backed mouse and the masked shrew. At no time did we take both species of jumping mice in the same habitat.

These mice go into hibernation during the month of October, and they usually do not resume their activity until early May. The latest date on which we have taken it in the fall was on October 29, 1947 on the floodplain of the Youghiogheny River at Ohiopyle, Fayette County. Our earliest spring date was April 29, 1949 for a specimen taken on the western slope of Laurel Hill Mountain, near Laughlintown, Westmoreland County.

BREEDING: Our breeding data for this species is meager. A female taken on July 21 showed five placental scars; and another, taken on July 21, had four placental scars. On August 14, we took a female with 6 embryos averaging 4 mm in length. The first litters are evidently born during the month of June or early in July. There is probably a second litter during the latter part of the summer.

SPECIMENS TAKEN: 33—Cambria 8, Fayette 4, Indiana 3, Somerset 16, Westmoreland 2.

MEASUREMENTS: Average 10 males; total length 217.2 mm (206-238 mm), tail length 136.5 mm (125-149 mm), hind foot 29.7 mm (28-32 mm); weight of 8 males, 18.6 grams (15.0-24.5 grams). Average 15 females; total length 222.3 mm (210-246 mm), tail length 140.8 mm (132-155 mm), hind foot 29.5 mm (28-31 mm); weight of 8 females, 19.8 grams (16.0-24.0 grams).

CANADA PORCUPINE

Erethizon dorsatum dorsatum

DISTRIBUTION: In former years probably not uncommon; but now rare and local. Confined to the Allegheny Mountains Section in Indiana, Cambria, Somerset and probably the eastern portion of Westmoreland County.

HABITAT: Forested areas; particularly about the vicinity of rock outcrops, or massive blocks of residual sandstone, where suitable den sites are available.

NOTES: The porcupine is of rare occurrence at the present time. On April 25, 1949, Messrs. Harry Roslund and Cole Wilde took a specimen on Cessna Run, about 4 miles northwest of Glen Campbell, Indiana County.

We heard many reports that porcupines were present about some of the large outcroppings and huge blocks of sandstone rock along the summit of Laurel Hill Mountain, but we found no evidence of their presence at any of the sites which we examined. Forest Ranger Clyde W. Carns states that about eighteen years ago, he observed many trees about the Rolling Rock fire tower, in Ligonier Township, which had been gnawed by these animals. Most of the trees from which the bark had been eaten being aspens. Mr. George W. Gordon, of Scottdale, told us that he knew of a porcupine being taken in the vicinity of Jones Mills, Westmoreland County; but he could not recall the date. In the late fall of 1948, Mr. L. B. Dungan, of Jennerstown, told us that he found the carcass of a large porcupine near his cabin at Pyle Spring, on the summit of Laurel Hill Mountain, in Jenners Township, Somerset County. Mr. Dungan stated that he found this animal during the summer of 1947. Game Protector N. M. Rhua states that an occasional porcupine is taken in Cambria County, but they are rather rare there. Rhoads (1903) stated that some years previously two porcupines had been taken in Washington County. It is extremely doubtful that porcupines ever occurred outside of the Allegheny Mountains Section, and such records as the one from Washington County are very probably based on animals which had escaped from captivity.

VARYING HARE

Lepus americanus virginianus

DISTRIBUTION: In former years this species probably occurred throughout most of the Allegheny Mountains Section. Now of rather rare and local occurrence in Cambria and Somerset counties, where it has been successfully reintroduced.

HABITAT: Forests of the mountains and of the high intermountain plateau. The optimum habitat is forest which has at least a moderate understory of small trees and shrubs to provide food and cover.

NOTES: In primeval times the range of the varying hare or "snowshoe rabbit" was apparently more or less continuous through the higher parts of our Allegheny Mountains Section, south to and beyond the Maryland and West Virginia state lines. The remains of this hare were found at the Fort Hill Indian Village site, in southern Somerset County, and at the Martin site on the Youghiogheny River near the Maryland border (Gilmore, 1946). Rhoads (1903) stated that it was formerly distributed all over Cambria County, and that it was also formerly common about Crumb, in Somerset County. By the turn of the century

the varying hare had disappeared from most of its original range. A few may have persisted in the Allegheny Mountain section in the extreme eastern part of Cambria County. It has been successfully introduced in the eastern part of Cambria County; and in at least the extreme northeastern corner of Somerset County. Game Protector C. M. Stanis reports that snowshoes are evidently prospering in Paint, Ogle and Shade Townships, Somerset County. This is, incidentally, the locality where Rhoads stated that they were formerly common. Attempts to restock the species in Fayette and Indiana counties have apparently not met with success, and this also seems to be true in all but the extreme northeastern corner of Somerset. In Cambria County it does not seem to be common anywhere at the present time. According to Game Protector J. L. DeLong, they were quite numerous in the vicinity of Portage about a quarter of a century ago, but none have been seen there in recent years.

MEARNS COTTONTAIL

Sylvilagus floridanus mearnsii

DISTRIBUTION: Occurs in all of the counties of this region.

HABITAT: The optimum habitat consists of an interspersion of open areas with growths of grasses and clovers and patches of low woody vegetation. This type of habitat occurs most frequently in the agricultural areas. Open woodlands with a moderate to dense groundcover of low woody or herbaceous plants, hollow logs and brush piles also constitute good cottontail habitat. Rather recently cut-over forest areas with an abundance of brush, coppice or thickets of shrubs, and sunny openings where herbaceous vegetation grows profusely are a temporarily excellent habitat; but densely forested areas, where there is virtually no groundcover of shrubs or herbaceous plants, are generally shunned.

NOTES: The lowly cottontail rabbit occupies a position of preeminence among our game mammals. It enjoys a wide distribution; and, although not always as abundant as the hunter would desire it to be; it always ranks first in the annual game bag. More attention and money are lavished upon the cottontail, and ways and means of increasing its numbers, than upon any other species of game mammal. This has involved the annual importation of thousands of cottontails, mostly from the state of Missouri; the live trapping and transfer of numerous others from areas which are closed to hunting to lands where public hunting is permitted; and a research program designed to determine ways to increase their natural reproduction.

While cottontails are definitely common to abundant in some localities, they are relatively scarce in many others. Sometimes apparently good habitats were found to be sparsely populated, but as a rule low populations could definitely be ascribed to habitat deficiencies. Generally, cottontails were quite common in the farming sections where there was also an abundance of low woody cover along fencerows, roadsides and stream banks. Few of these animals were ever observed where farming practices had virtually eliminated all brushy cover. Older aban-

done field areas, worn out and with highly acid soils, often provide cover; but they are deficient in good food plants. Heavily grazed woodlands are deficient in both cover and food plants; and the same may be said for dense stands of nearly even-aged trees. Many "old timers" can recall the days when cottontails abounded in the mountains—before the days when the trees grew up and eliminated most of the low woody vegetation. Now the rabbit population throughout the mountains is very low and naturally limited to recently cut-over areas and the vicinity of roads.

The cottontail has a host of enemies including various hawks, owls, foxes, skunks, weasels and marauding house cats. Floods often drown the nests of young in low grounds; and many others, placed in meadows, are destroyed during mowing operations. Nests of small young rabbits, placed on high ground, have been known to drown during a hard shower. The death toll on the highways in most places is very high, particularly during the early spring.

Throughout the warmer months cottontails usually conceal themselves in tall grasses and other vegetation. During the winter many of them resort to underground burrows such as woodchuck dens, particularly during periods of severe stormy weather. The importance of woodchuck dens has been discussed in some detail by Gerstell (1939). Prolonged periods of severe cold and deep snows probably take their toll of rabbits. During the early part of February 1948, Gifford found that rabbits in Greene County were obviously weakened and apparently suffering from lack of food during a period of deep snow.

FOOD HABITS: During the growing season—from early spring until late in the fall—the cottontail finds an abundance of food practically everywhere but in heavily wooded areas. Various grasses and other herbaceous plants comprise the bulk of their diet during these months. Clovers and other legumes are high on the list of preferred food plants; and these include such cultivated species as beans, soybeans and garden-peas. Almost every gardener knows this only too well, for to him cottontail rabbits often become a real problem. During the winter months they continue to subsist on whatever green vegetation may be available; but when the ground is covered with snow, the bark of various woody plants becomes their staple food. Usually only stems under two inches are extensively barked. Sumac (*Rhus typhina* and *Rhus glabra*) bark seems to be preferred whenever it is available. Other woody plants rather extensively utilized are the crabapple, apple, blackberry, raspberry, black locust; and occasionally, wild black cherry and poison ivy. In the mountainous sections we have noted that they frequently browse on the twigs of very small yellow and black birch trees. Gifford states that in Greene County the bark of the burning brush (*Evonymus atropurpureus*) is extensively eaten during the winter months. Branches pruned from apple trees and left upon the ground are soon discovered and barked by hungry cottontails. Fallen apples are relished during the late fall and early winter. We observed veritable mazes of rabbit tracks in cornfields during the early winter. Waste grain resulting from the husking operation was apparently the chief attraction.

SPECIMENS TAKEN: 6—Fayette 2, Somerset 3, Westmoreland 1.

NEW ENGLAND COTTONTAIL

Sylvilagus transitionalis

DISTRIBUTION: Formerly, at least, throughout the greater part of the highlands of the Allegheny Mountains Section.

HABITAT: Forested and brushy areas.

NOTES: According to Rhoads (1903) the New England cottontail occurred throughout the mountainous portions of Pennsylvania. Hamilton (1943) states that it ranges "south in the Allegheny Mountains to southeastern Alabama". It should most certainly occur in the mountains of southwestern Pennsylvania, although we have taken no specimens of this species.

NORTHERN WHITE-TAILED DEER

Odocoileus virginianus borealis

DISTRIBUTION: Occurs in every county of this region, but most numerous in the forests of the Allegheny Mountains Section.

HABITAT: Primarily forested, semi-wooded, and extensive brushy areas. Fields within their range are frequently utilized in feeding.

NOTES: At the beginning of the present century the native white-tailed deer had virtually disappeared from this region, and any hunter who was lucky enough to bag one of these animals was almost assured of mention on the front page of the local newspaper.

In 1905 the first refuges were established by the Board of Game Commissioners, the earliest ones all being located on State Forest land. Each of these refuges was stocked with deer, about 50 animals being released in each area; the ratio of the sexes being about one buck to every three does (Gordon, 1942). This was followed, in 1907, by the enactment of the so-called "buck law", which made it illegal to kill any antlerless deer.

At this time, however, the cut-over, burned-over forests of the state were just on their way back; there was an unlimited amount of brush-stage forest, the most optimum deer habitat that ever existed. With an abundance of food and cover, and given adequate protection, deer increased so rapidly that in less than twenty years overpopulations began to cause concern. It then became apparent that measures to control the size of the herd were necessary, and in 1928 the first state-wide antlerless deer season was declared.

In 1911 a refuge, comprising about 1,740 acres, was established in the Forbes State Forest, southeast of the village of Rector in Westmoreland County. That same year about 20 head of deer were imported from Michigan and released in the refuge area; and in 1913 some 10 or 12 additional head were released there. Those were the first deer, to our knowledge, to be released in southwestern Pennsylvania. Nine were released in Cambria County during 1923 or 1924, and 25 were released in Fayette County during 1924 and 1925. Today there is not a county in southwestern Pennsylvania where a deer is a novelty. In fact, in the agricultural sections, they are fast becoming a major nuisance. The legal kill of deer in the counties of southwestern Pennsylvania from 1924 to 1947 is presented in Table 8.

Coincident with the rapid increase in the deer population, normal ecological changes in the forest areas were acting to reduce their deer carrying capacity. As the forest trees grew, there was less food for deer; for the shade resulting from the closing in of the crowns of the dominant trees eliminated more and more of the understory of smaller trees and shrubs. As a result many forest areas were soon eaten out by the deer; and sometimes all available browse was eaten as high as the largest deer could reach. Gerstell (1938) found that the deer range in the mountains of Westmoreland County was already in a poor condition a decade ago. In recent years many scattered cuttings have been made in the forests throughout southwestern Pennsylvania; but this has only locally alleviated the general scarcity of browse. We have not found, however, any conditions comparable to those prevalent in the Allegheny Plateau Section in the northern part of the state. Most of the deer in this region seem to have come through the winters of 1947-1948 and 1948-1949 in a good condition.

FOOD HABITS: From spring until fall the deer graze extensively on herbaceous vegetation, and they are often seen in meadows or pasture fields in proximity to woodland. The fresh shoots of woody plants, particularly in cut-over areas are also much sought after.

Later in the summer, and through the fall season, they regularly visit the fields of corn or of buckwheat. We found that many deer were frequenting a cornfield near Laughlintown at nights during the early part of December 1948. The corn in this field had been cut and shocked but not husked. Throughout the late fall and winter deer constantly sought the fallen acorns under oak trees on the slopes of Laurel Hill Mountain; or hawthorn (*Crataegus*) and crabapple fruits in old abandoned fields. During the winter season we observed that the deer were eating the evergreen fronds of the Christmas fern (*Polystichum acrostichoides*), often pawing through deep snow to reach them. Observations were made on the utilization of woody plants, with the following results:

Species quite generally available and extensively browsed:

- Tulip Tree (*Liriodendron tulipifera*)
- Yellow Birch (*Betula lutea*)
- Black Birch (*Betula lenta*)
- Red Maple (*Acer rubrum*)

Species not generally available but usually very heavily browsed:

- Hobble-bush (*Viburnum alnifolium*)
- Dwarf Sumach (*Rhus copallina*)

Species quite generally available but only moderately browsed:

- Sugar Maple (*Acer saccharum*)
- Striped Maple (*Acer pennsylvanicum*)
- Oaks (*Quercus* sp.)
- Common Greenbrier (*Smilax rotundifolia*)
- Sassafras (*Sassafras albidum*)
- Quaking Aspen (*Populus tremuloides*)
- Maple-leaved Viburnum (*Viburnum acerifolium*)
- Blackberry and Raspberry (*Rubus* sp.)
- Wild Hydrangea (*Hydrangea arborescens*)
- Witch-hazel (*Hamamelis virginiana*)

TABLE 8
LEGAL KILL OF WHITE-TAILED DEER
(* Antlerless deer)

<i>Year</i>	<i>Allegheny</i>	<i>Cambria</i>	<i>Fayette</i>	<i>Greene</i>	<i>Indiana</i>	<i>Somerset</i>	<i>Washington</i>	<i>Westmoreland</i>	<i>TOTAL</i>
1924.....	3	84	60		13	37		116	313
1925.....	1	86	40		15	96		124	362
1926.....	1	116	79		11	72		206	485
1927.....	2	157	114		32	143		259	707
1928.....	2*	175*	128*		39*	202*		412*	958*
1929.....	15	287	155	1	80	312		437	1,287
1930.....	8	252	253		63	405		411	1,392
		28*	128*			232*		371*	759*
1931.....	22	378	211		60	373		369	1,413
	49*	984*	265*		260*	1,445*		1,774*	4,777*
1932.....	5	238	63	1	104	305		273	989
1933.....	9	294	70		97	305		295	1,070
1934.....	6	392	119		147	309		336	1,309
1935.....	10	398	104		143	327		407	1,389
1936.....	5	341	149		134	251		428	1,308
1937.....	6	461	125		130	363		480	1,565
1938.....	138*	2,788*	897*	20*	1,208*	4,349*	14*	4,436*	13,850*
1939.....	20	471	216	2	240	862	5	507	2,323
1940.....	23	389	326	4	262	817	1	537	2,359
	67*	1,967*	867*	11*	726*	3,211*	26*	2,329*	9,204*
1941.....	9	121	149	7	62	237		87	672
1942.....	8	178	313	16	136	449		233	1,333
1943.....	4	122	226	5	79	314	2	147	899
1944.....	12	165	346	12	155	445	11	211	1,357
1945.....	22	177	307	18	212	410	2	287	1,426
1946.....	17	325	415	16	222	812		470	2,277
	23	270	342	28	286	649	5	375	1,978
1947.....	35*	491*	460*	15*	172*	768*	9*	286*	2,236*
1948.....	36	368	356	20	413	791	13	584	2,581

Species quite generally available but only occasionally browsed:

Blueberries (*Vaccinium pallidum* and *V. angustifolium*)
Black Huckleberry (*Gaylussacia baccata*)
Hemlock (*Tsuga canadensis*)
Rhododendron (*Rhododendron maximum*)
Mountain Laurel (*Kalmia latifolia*)
Wild Black Cherry (*Prunus serotina*)
Fire Cherry (*Prunus pennsylvanicum*)
Juneberry (*Amelanchier canadensis*)
White Ash (*Fraxinus americana*)
Beech (*Fagus grandifolia*)
Black Gum (*Nyssa sylvatica*)

During the winter months, particularly when the snows are deep at higher elevations on the mountains, the deer have a tendency to concentrate in sheltered valleys nearer the foothills. Occasionally, where such concentrations have occurred, we have seen areas where rhododendron was rather heavily browsed; and in one yarding area the growth of mountain laurel had just about been eliminated by heavy browsing over a period of years. These are exceptional conditions, however, and they seem to occur only where the deer yard in areas where practically no other browse is available.

BREEDING: The majority of the fawns are born during the month of May. During the summer months we have observed many does accompanied by fawns. A surprisingly large number of those seen had but a single fawn.

SPECIMENS TAKEN: 2—Westmoreland 2.

VANISHED SPECIES

At least five species of mammals found in southwestern Pennsylvania within historic times are now extinct in the region. These are the bison, elk, timber wolf, panther and Canada lynx. The native beaver also disappeared from the region, and the animals found here at present are descended from those restocked by the Pennsylvania Game Commission. A half century ago the white-tailed deer also was virtually extinct (Rhoads, 1903), and the present herd of these animals has largely resulted from restocking and adequate protection. There is no reliable evidence that either the pine marten (*Martes americana*), or the fisher (*Martes pennanti*), ever occurred this far south in Pennsylvania; at least there seem to be no records or historical references to either species. The otter, on the other hand, was probably a fairly common species along the larger creeks and rivers; but it occurs very rarely, if at all, at the present time.

An account of the vanished species of mammals, including the last known county records for them, is given in the following pages. All of the historical data on county occurrences have been compiled by Col. Henry W. Shoemaker (correspondence, 1949) from his vast store of personal records and records gleaned from the archives and county histories. Some very interesting data regarding the remains of mammals at

three archeological sites in this region were taken from Gilmore (1946). These pre-Columbian Indian village sites were located as follows: the Fort Hill site in Addison Township, Somerset County, on the Casselman River near Confluence; the Martin site in Henry Clay Township, Fayette County, on the Youghiogheny River near the Maryland state line; and the Phillips site in Spring Hill Township, Fayette County, at Morris Crossroads.

TIMBER OR GRAY WOLF

Canis lupus

According to all historical accounts the timber wolf was a common denizen of the forest throughout this region, even long after the days of settlement. Although there are no definite records of its presence subsequent to 1890, there have been many rumors of its occurrence long after that date. Some of these reports may have been based upon the capture of animals which had been in confinement, although several of the recent reports have been traced to the presence of large feral dogs or coyotes.

Allegheny County: Last record 1830, in the Raccoon Creek valley.

Cambria County: Last record probably 1881 in the Allegheny Mountains and near Patton.

Fayette County: Last one killed in Salt Lick Township in 1850.

Greene County: Last record 1850.

Indiana County: Last one killed near Black Lick in 1890.

Somerset County: The last positive record is a specimen killed by Mr. Livengood at Rockwood in 1870. Rhoads (1903) said "I was informed by several persons that wolves made their home in Laurel Ridge". That was in 1898.

Washington County: Last record 1850.

Westmoreland County: One was killed on Chestnut Ridge in 1860.

COUGAR; PANTHER; OR MOUNTAIN LION

Felis concolor

No remains of this large cat were found at the Indian Village sites in the southern portions of Fayette and Somerset counties. "This may be significant, and indicate a natural or socially dictated reluctance of the Indian to hunt the animal because the colonial records state that it was very common in this area in late aboriginal times" (Gilmore, 1946). Judging by the references made to "painters" and "panthers" in the records, the species must have been quite common throughout the present region during the days of its settlement by the white man, and for many years thereafter.

Allegheny County: Last record 1790. Probably in "Pantlier Hollow", now part of Schenley Park, Pittsburgh.

Cambria County: One was killed in the Conemaugh Valley in 1863.

A panther was reported seen by R. B. Long's woodcutters at the head of Bob's Creek on the Cambria Blair County line in 1916. One is

supposed to have killed a sow belonging to R. B. Streyer in the Barrens on the Blair-Cambria County line in 1912.

Greene County: One was killed on Dunkard Creek in 1810.

Indiana County: Last record 1865.

Fayette County: One was killed at Dunbar's Camp (Dunbar) in 1850.

According to Fayette County newspapers a panther was seen on Laurel Hill Mountain, by a number of reliable observers, in 1911.

Somerset County: One was killed by Jacob Hostetler, in the Allegheny Mountain, in 1861. Mr. Edward Shaffer, a taxidermist of Boswell and a reliable observer, states that he saw a panther on Laurel Hill Mountain, near Bakersville, about twenty-five years ago.

Washington County: One was killed at "McClelland's Bridge", by James Iams, in 1887. The previous record for the county was in 1857.

Westmoreland County: One was killed by a man named Groves on Breastworks Run in 1848.

CANADA LYNX

Lynx canadensis

The Canada lynx probably never was numerous in our region, but in the historical past it has been recorded from every county. More than likely the real home of this animal was in the higher mountains, from which individuals occasionally strayed into areas to the westward. The original range of the Canada lynx extended across our region into the highlands of western Maryland for Browning (1928) mentions his occasional capture of "catamounts" in what is now Garrett County, Maryland. Although the term "catamount" has elsewhere been applied to the panther, the name, at least in our region, was commonly applied to the present species. Browning repeatedly refers to both "catamounts" and "panthers", and he leaves very little doubt but that they were entirely different animals.

Allegheny County: One was killed by a man named Baum in 1790.

Cambria County: One was killed by W. S. Long, near Cherry Tree, in 1870.

Fayette County: One was killed on Laurel Hill Mountain in 1877.

Greene County: One was killed by Jacob Bobbett on Dunkard Creek in 1792.

Indiana County: One was killed in Banks Township in 1875, by J. E. Smith.

Somerset County: One was killed on Negro Mountain in 1868.

Washington County: Last record 1785.

Westmoreland County: One was killed by L. T. Weimer, of Laughlintown, on Laurel Hill Mountain (Ligonier Township) in 1898. The previous record for the county was 1892.

AMERICAN BISON OR BUFFALO

Bison bison

Numbers of bison roamed the hills and valleys of southwestern Pennsylvania before the advent of the white man; but it seems to have been rarely encountered in the region following the French and Indian War (1755-1758). There is a Buffalo Creek and a village of Buffalo in Washington County; and a place called Buffalo Bridge in Somerset County commemorating the former occurrence of the animal.

Allegheny County: Last record 1780.

Cambria County: Last record was an animal killed by Capt. Richard McGuire at Stony Creek, in the year 1800.

Fayette County: One was killed in the Laurel Hill Mountain section in 1801 by a man named Laughlin.

Greene County: Last record 1798.

Indiana County: One was killed by Moses Chambers in Montgomery Township in 1805.

Somerset County: The one killed by Col. John Yutsey in the Stony Creek Glades during the year 1810 was the last known specimen in southwestern Pennsylvania.

Washington County: Last record 1785.

Westmoreland County: One was killed by a man named Hufnagle along Indian Creek in the year 1802.

AMERICAN ELK OR WAPITI

Cervus canadensis

Elk remains found at the Indian village sites in southern Fayette and Somerset counties indicated that this was the "second most common food animal" of the pre-Columbian inhabitants. "The remains indicate an animal slightly smaller than the western elk (skeletons from Wyoming for comparison), considering equal ages on the basis of epiphyseal closures. . . . A horn base from the Fort Hill site is 21 cm in circumference below the burr, about the grasp of a large-handed man, and big for any elk" (Gilmore, 1946). Apparently the animal roamed over much of the forested lands in this portion of the state prior to the advent of the white man's civilization, but it was exterminated in most sections soon after the first settlements.

Allegheny County: Last record 1780.

Cambria County: One was killed in 1881, supposedly along Black Lick Run. Two were seen in 1882. It is believed that these animals were driven south by dogs, possibly from Elk County.

Fayette County: One was killed by an Indian named Hechston in 1790.

Greene County: One was killed in 1795 along Dunkard Creek.

Indiana County: One was killed by Jim Jacobs, a Seneca Indian, along Bear Run near the Clearfield County line, in 1863.

Somerset County: One was killed by Frederick Shank in the Stony Creek Glades in 1825.

Washington County: Last record 1800.

Westmoreland County: One was killed by a man named Lobengier in 1820, presumably in the Ligonier Valley section.

EASTERN RICE RAT

Oryzomys palustris palustris

According to Gilmore (1946) two specimens were obtained from the archeological sites in southwestern Pennsylvania; a lower jaw from the Fort Hill site, and the anterior half of a skull from the Martin site. This author states that "these finds are interesting in that they extend the former range about 150 miles west from coastal Maryland to southwestern Pennsylvania".

CONCLUSIONS AND RECOMMENDATIONS

1. The present deer herd must of necessity be periodically reduced and kept within the carrying capacity of the range. The increasing tendency on the part of the deer to spread into the agricultural sections, outside of the normal deer range, must be carefully controlled. There is an abnormally high ratio of does to bucks. The surplus does should be periodically removed for the welfare of the herd, as well as the benefit of the deer range; in spite of the ill-conceived opposition, which unfortunately always tends to hamper the proper management of the deer herd.

2. Certain of the larger refuge areas are at present serving no useful purpose. Concentration of deer in these refuge areas has resulted in the almost complete annihilation of any shrubby understory which has not already been shaded out by the maturation of the timber stand. We do not believe that refuges are needed for deer at the present time. More numerous but smaller refuge areas might well be established for wild turkeys in areas where good food and cover conditions now exist, or can be developed.

3. It is recommended that all protection be removed from the opossum (*Didelphis virginiana*.) The present value of this species as a fur-bearer is almost negligible and it is not sought by trappers. On the other hand, it may be a potentially serious predator; its numbers have increased almost everywhere during recent years. We would not recommend that a bounty be paid on opossums.

4. We believe that the bounty system is ineffective and outmoded as a means of controlling predators. It has certainly not been effective in controlling the population of the gray fox, which has not only increased in numbers *but actually extended its range in spite of the bounty*.

5. The seasons for the trapping of various fur-bearing animals naturally constitutes a problem. Whatever is done, there will always be

some who will be dissatisfied with the decisions. Unprime pelts naturally result in quite an economic loss to the trappers; and the taking of animals before they become prime should, in most cases, be discouraged. The pelt of the muskrat does not become fully prime before the latter part of January or the month of February. However, at that time of the year the pelts of many individuals are badly cut or damaged due to intraspecific strife at the approach of the breeding season. It is the almost universal opinion of fur dealers that the unprime or partially prime pelts of muskrats taken during the early part of the winter, are actually worth more than the damaged but fully prime pelts would be. Law enforcement problems are alleviated when the season on both the mink and the muskrat run concurrently. The majority of the trappers and fur dealers apparently would be satisfied if the season on both mink and muskrats came in on the fifteenth of November. If this date were generally applied to all protected fur-bearing animals, there would be very little if any economic loss due to unprime pelts.

DATA AND REPORTS

The original data, field notes and specimens on which this report is based have been deposited in the Section of Mammalogy, Carnegie Museum, Pittsburgh, Pennsylvania.

This report was prepared by William C. Grimm, Project Leader, and Harvey A. Roberts, Assistant Project Leader.

BOUNTIES PAID ON NOXIOUS MAMMALS FROM JUNE 1937 TO MAY 1948

GRAY FOX

<i>County</i>	<i>37-38</i>	<i>38-39</i>	<i>39-40</i>	<i>40-41</i>	<i>41-42</i>	<i>42-43</i>	<i>43-44</i>	<i>44-45</i>	<i>45-46</i>	<i>46-47</i>	<i>47-48</i>
Allegheny	41	81	106	161	140	129	103	132	311	262	239
Cambria	158	137	119	115	48	98	80	82	183	175	226
Fayette	345	360	217	433	212	295	287	200	419	486	344
Greene	41	74	135	125	98	114	205	261	570	466	508
Indiana	125	145	130	106	73	109	160	131	444	655	494
Somerset	298	350	320	435	201	218	246	215	337	423	349
Washington . . .	54	145	134	212	183	184	199	256	549	529	339
Westmoreland .	258	270	278	270	191	201	226	250	463	547	513
TOTAL	1,320	1,562	1,439	1,857	1,146	1,348	1,506	1,527	3,276	3,543	3,012

RED FOX

<i>County</i>	<i>37-38</i>	<i>38-39</i>	<i>39-40</i>	<i>40-41</i>	<i>41-42</i>	<i>42-43</i>	<i>43-44</i>	<i>44-45</i>	<i>45-46</i>	<i>46-47</i>	<i>47-48</i>
Allegheny	*	*	*	*	*	*	*	*	381	211	213
Cambria	*	*	*	*	*	*	*	*	164	227	140
Fayette	*	*	*	*	*	*	*	*	486	578	323
Greene	*	*	*	*	*	*	*	*	1,349	836	496
Indiana	*	*	*	*	*	*	*	*	102	121	78
Somerset	*	*	*	*	*	*	*	*	917	953	512
Washington ...	*	*	*	*	*	*	*	*	866	728	495
Westmoreland .	*	*	*	*	*	*	*	*	258	304	190
TOTAL									4,523	3,958	2,447

* No bounty paid.

WEASELS

<i>County</i>	<i>37-38</i>	<i>38-39</i>	<i>39-40</i>	<i>40-41</i>	<i>41-42</i>	<i>42-43</i>	<i>43-44</i>	<i>44-45</i>	<i>45-46</i>	<i>46-47</i>	<i>47-48</i>
Allegheny	301	408	213	172	161	161	30	53	156	223	116
Cambria	632	1,324	604	568	392	436	220	79	340	628	598
Fayette	495	668	320	381	130	192	109	89	174	385	269
Greene	40	99	104	43	25	50	49	38	40	90	70
Indiana	803	1,177	777	610	367	584	434	165	348	604	625
Somerset	1,074	1,509	847	1,249	476	700	370	202	342	1,037	894
Washington ...	186	245	210	109	140	147	54	37	77	199	73
Westmoreland .	818	1,221	993	595	419	529	245	183	391	690	523
TOTAL	4,349	6,651	4,068	3,727	2,110	2,799	1,511	846	1,868	3,856	3,168

FUR HARVEST IN STATE OF PENNSYLVANIA: AVERAGE PRICES AND TOTAL VALUE. 1938-1946.

Season	1938-39	1939-40	1940-41	1941-42	1942-43	1943-44	1944-45	1945-46
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MUSKRAT

Number taken . . .	301,275	407,767	373,249	511,775	486,368	610,968	306,437	610,834
Average value per pelt (\$) . . .	.82	1.04	1.31	1.40	1.67	2.23	1.82	2.18
Total value (\$) . . .	249,44.09	426,395.55	488,098.05	716,960.57	805,257.82	1,363,161.46	559,265.31	1,332,309.95

SKUNK

Number taken . . .	229,168	321,893	255,439	228,037	148,075	163,584	103,207	104,088
Average value per pelt (\$) . . .	.73	.63	.77	1.02	1.14	1.79	1.08	1.30
Total value (\$) . . .	168,861.18	204,970.50	195,995.78	233,059.03	168,584.76	292,275.10	111,510.91	135,634.93

MINK

Number taken . . .	7,858	9,034	6,736	7,449	6,326	10,785	7,415	11,298
Average value per pelt (\$) . . .	6.29	5.32	5.85	6.08	5.09	10.84	10.48	19.68
Total value (\$) . . .	49,438.17	48,099.18	39,407.51	45,304.12	32,211.40	116,021.48	77,689.57	222,301.41

OPOSSUM

Number taken . . .	103,516	110,479	70,831	67,257	65,445	110,850	49,572	40,992
Average value per pelt (\$) . . .	.20	.20	.22	.25	.27	.45	.28	.43
Total value (\$) . . .	21,059.69	22,198.13	15,276.07	16,805.00	17,589.88	51,941.71	13,644.89	17,677.89

RACCOON

Number taken . . .	28,975	33,095	34,639	35,959	30,140	46,692	38,122	46,951
Average value per pelt (\$) . . .	1.56	1.88	2.13	2.67	3.12	3.66	1.84	1.70
Total value (\$) . . .	45,220.11	62,229.45	73,711.46	95,992.07	94,200.18	170,863.54	70,069.84	79,674.47

WEASELS

Number taken . . .	38,313	36,581	22,363	18,120	26,274	25,527	5,487	12,230
Average value per pelt (\$) . . .	.30	.24	.37	.55	.84	.90	.87	1.78
Total value (\$) . . .	11,590.35	8,886.26	8,272.39	10,047.92	21,853.74	23,043.20	4,756.31	21,776.68

RED FOX

Number taken . . .	5,968	6,955	7,548	6,871	6,604	11,850	9,460	26,480
Average value per pelt (\$) . . .	2.96	2.23	2.09	3.38	4.47	6.74	5.06	2.56
Total value (\$) . . .	17,715.11	15,435.53	15,779.63	22,579.21	29,528.24	79,862.32	47,842.65	67,698.50

GRAY FOX

Number taken . . .	7,861	10,519	7,846	6,647	8,032	10,354	10,230	19,144
Average value per pelt (\$) . . .	1.58	1.55	1.50	1.73	1.90	2.50	2.15	1.78
Total value (\$) . . .	12,441.23	16,385.81	11,748.78	11,521.95	15,260.80	25,868.15	21,958.30	34,167.64

WILDCAT (LYNX)

Number taken	11	12	9	18	3	30	13	25
Average value per pelt (\$) ....	.99	1.22	1.11	1.64	1.08	2.00	2.52	2.23
Total value (\$) ...	10.95	14.65	10.00	29.95	3.25	62.00	32.75	55.75

OTTER

Number taken	13	18	15	14		21	33	23
Average value per pelt (\$)	12.30	9.66	7.40	6.72		14.83	11.45	18.02
Total value (\$) ...	160.00	174.00	111.00	106.75		311.50	377.75	414.50

BEAVER

Number taken	371	702	1,195	1,143	2,011	1,281	1,663	2,694
Average value per pelt (\$)	11.15	13.54	23.51	20.15	34.50	29.95	31.50	53.14
Total value (\$) ...	4,137.50	9,512.14	28,097.84	23,028.65	68,387.15	38,365.95	52,376.56	143,154.46

Total value of all species (\$) ...	580,078.38	814,301.20	876,468.51	1,175,494.82	1,252,877.22	2,162,676.41	959,524.84	2,054,866.18
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